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**THE NASA DIGITAL VGH PROGRAM -  
EXPLORATION OF METHODS AND FINAL RESULTS**

**Volume IV - B 747 Data 1978-1980: 1689 HOURS**

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**Langley Research Center  
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## **FOREWORD**

This report was prepared by Eagle Engineering, Inc., Hampton Division, under contract NASW 4430, sponsored by NASA Langley Research Center and the Federal Aviation Administration Technical Center under the FAA-NASA Interagency Agreement No. DTFA03-890-A-00019 of 13 June 1989. This report fulfills the requirement of the Program Plan for the National Aging Aircraft Research Program, DOT/FAA/CT-88/32, August 1989, Paragraph 2.3.2.1, Flight Loads.

The Eagle Engineering, Inc. effort was performed by Norman L. Crabbill and administered under the direction of Joseph W. Stickle (NASA Langley Research Center) and Thomas DeFiore (FAA Technical Center).



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SUMMARY

Data obtained from the Digital Flight Data Recorder system of Boeing 747 aircraft in 442 flights and 1689 hours of airline revenue operations are presented as an extension of the work documented in Volume I of this report. Data on conditions with flap deployment and autopilot use are given. In addition, acceleration statistics are presented from 23 hours on nonrevenue flights. No discussion of the data is presented.

INTRODUCTION

This document presents the results of the NASA DVGH Program obtained during 1978-1980 operations of Boeing B 747 aircraft. This volume is an extension of the work and methods documented in Volume I. The data reduction analysis and methods and data presentation are essentially the same as those reported in Volume I. However, this report does contain additional data on autopilot usage and some limited acceleration-derived exceedance data obtained from non-revenue flights.

## AIRCRAFT AND INSTRUMENTATION

### Aircraft

The aircraft type was the Boeing B 747-100 with four Pratt and Whitney JT9D-3A and -7 turbofan engines. Characteristics of the aircraft used in the data reduction process are given in Table I. The configuration is shown in figure 1.

### Instrumentation

The data were obtained fromm the Digital Flight Data Recorder system described in Volume I. Measurements were:

<u>Parameter</u>	<u>Range and Units</u>	<u>Samples per Second</u>
$a_n + 1$	-3g to +6g	4
$a_y$	-1g to +1g	4
CAS	100 to 450 kts	1
HP	-1,000 to 50,000 ft	1
FLP	-5° to 60°	1
Cabin Pressure	0 to 15 psia	1
Autopilot Status	Off or On	Discrete

Note that Spoiler data are not reported here, although they were in Volume I. The cabin pressure data type is the same as reported in Volume II.

#### SCOPE OF DATA

Data were collected from five aircraft operating in regular airline service over the area shown in figure 2 during 1978 through 1980: Almost all of the data (442 flights and 1689 hours) were obtained during passenger-carrying revenue service; a small amount (73 flights and 23 hours) was obtained during nonrevenue service (ferry flights mainly, although some training and maintenance flights may have been included). Due to operational difficulties, it was not practical to obtain continuous data from one aircraft as in Volumes I and II; it was therefore decided to obtain the data from any of five 747-100 aircraft being operated by the airline over the service route during the 30 months of the test.

#### DATA REDUCTION PROCESS

The Data Reduction Process is basically the same as described in Volume I. The filter used to separate maneuver and gust accelerations was similar to that described in Volume I except that the high limit of the band pass was set at 0.75 Hz based on an inspection of representative spectra. Although the results of reference 13 in Volume I indicate that the operation of the autopilot can cause up to a 20 percent reduction in the normal acceleration peak response to continuous turbulence, it was decided, after consultation with the industry, not to account for this in deriving  $U_{de}$ , in order to maintain comparability with the earlier VGH results, even though the autopilot status was being monitored in this investigation.

## RESULTS

### Flight Profile and Acceleration Derived Statistics

Presentation of Flight Profile Statistics results is similar to that described in Volume I. Flight Profile Statistics are given in Percent of Time, and as Maximum Values on a Percent of Flight basis for Entire Flights (flaps up or down) and for Flaps Deflected. For operations reported in this volume, the conditions existing at flap retraction after lift off, and the conditions existing at flap deflection before landing are given.

Acceleration Derived Statistics are also presented as in Volume I, except that with Flaps Deflected, the maximum  $a_n$  per flight and the Equivalent Airspeed occurring are presented for the various flap detents in take off and landing. Also new are level crossing counts for the Acceleration Derived quantities for non-revenue flights. All other results are for revenue flights. These Acceleration Derived quantities are subject to the same limitations discussed in Volume I, which indicates that the exceedances derived from the DFDR system at 4 samples per second may be significantly less than if actual peak values were counted.

The detailed Flight Profile and Acceleration Derived Statistics are given in figures 3 through 24 as shown in Table II. No discussion of the data is presented.

### Autopilot Usage and Effects

Autopilot status was monitored as off or on without regard to the exact on-mode. The autopilot was on about 92 percent of the time; 7.5 percent of the time that it was on, the low-amplitude

limit cycle in normal acceleration appeared as discussed in Volume I. Its characteristics are summarized in figure 25. This phenomenon is believed to be due to off-nominal autopilot operation in the altitude-hold mode, and it is more fully discussed in Volumes I and II.

#### Cabin Pressure

Absolute cabin pressure was measured and used to compute the quantity "Maximum Differential Cabin Pressure per Flight" by using the measured absolute cabin pressure and the standard atmosphere based on the indicated pressure altitude. The distribution of this quantity as a function of the percent of flights is shown in figure 26.

#### CONCLUDING REMARKS

Data obtained from the Digital Flight Data Recorder system of Boeing 747-100 aircraft in 442 flights and 1689 hours of airline revenue operations are presented as an extension of the work documented in Volume I of this report. Some new data on conditions with flap deployment and autopilot use are given. In addition, acceleration statistics are presented from 23 hours of nonrevenue flights. No general discussion of the data is presented.

TABLE I  
BOEING B 747-100 CHARACTERISTICS USED IN THE ANALYSIS

o Geometrical Characteristics

- o Wing Area = 5500 ft<sup>2</sup>
- o Wing Mean Chord = 27.32 ft

o Lift Curve Slope  $C_{L\alpha}$  per degree

o Flaps up

<u>M</u>	<u>HP = 0</u>	<u>20 kft</u>	<u>40kft</u>
.2	.0860	.0885	.0902
.4	.0820	.0875	.0910
.5	.0790	.0870	.0922
.6	.0790	.0885	.0970
.7	.0750	.0865	.0970
.8	.0675	.0830	.0960
.85	-	.0860	.1005
.90	-	.0940	.1095

o Flaps down

<u>FLP, deg</u>	<u>HP ≈ 0</u>
0	.0860
2	.1000
10	.1050
20	.1050
30	.1018

- o Weight was computed linearly with time from take off to landing as described in Appendix C in Volume I.

**TABLE II**  
**INDEX OF FLIGHT PROFILE AND ACCELERATION STATISTICS**

**FLIGHT PROFILE STATISTICS**

o ENTIRE FLIGHTS

Figure Number	Subject	Page Numbers
3	Weight vs. Flight Duration	12-17
4	Altitudes and Gross Weights	18
5	Altitudes and Airspeeds	19-22
6	Altitude Summary	23
7	Maximum Altitudes	24-25

o FLAPS DEFLECTED

8	Flap Detent Use	26
9	Weights, Altitudes and Airspeeds	27-36
10	Flap Deflection Times	37-39
11	Equivalent Airspeeds and Detents	40
12	Flap Use above 10,000 ft	41

TABLE II (continued)  
ACCELERATION DERIVED STATISTICS

o ENTIRE FLIGHTS

Figure Number	Subject	Page Numbers
13 Normal Acceleration Exceedances		
(a)	$a_n$ matrix	42
(b)	$a_{nM}$ matrix	43
(c)	$a_{nG}$ matrix	44
(d)-(m)	$a_n$ , $a_{nM}$ , $a_{nG}$ plots	45-54
14 Lateral Acceleration Exceedances		
(a)	$a_y$ matrix	55
(b)-(k)	$a_y$ plots	56-65
15 $U_{de}$ Exceedances		
(a)	$U_{de}$ matrix	66
(b)-(k)	$U_{de}$ plots	67-76
16 Peak Positive and Negative $a_n$ vs. Altitude		
(a)	$a_n$ matrix	77
(b)-(k)	$a_n$ plots	78-87
17 Peak Positive and Negative $a_{nM}$ vs. Altitude		
(a)	$a_{nM}$ matrix	88
(b)-(k)	$a_{nM}$ plots	89-98
18 Peak Positive and Negative $a_{nG}$ vs. Altitude		
(a)	$a_{nG}$ matrix	99
(b)-(k)	$a_{nG}$ plots	100-109

TABLE II (Concluded)

19	Peak Positive and Negative $U_{de}$ vs. Altitude	
(a)	$U_{de}$ matrix	110
(b)-(k)	$U_{de}$ plots	111-120
o FLAPS DEFLECTED		
Figure Number	Subject	Page Numbers
20	$a_n$ Exceedances with Flaps Deflected	
(a)	Take Off Detents matrix	121
(b)	Take Off Detents plot	122
(c)	Landing Detents matrix	123
(d)	Landing Detents plot	124
21	Peak Positive and Negative $a_n$ per flight and EAS bands	
(a)-(c)	Take Off Detents	125-127
(d)-(i)	Landing Detents	128-133
o NON-REVENUE FLIGHTS		
Figure Number	Subject	Page Numbers
22	Normal Acceleration Exceedances	
(a)	$a_n$ matrix	134
(b)	$a_{nM}$ matrix	135
(c)	$a_{nG}$ matrix	136
(d)-(m)	$a_n$ , $a_{nM}$ , $a_{nG}$ plots	137-146
23	Lateral Acceleration Exceedances	
(a)	$a_y$ matrix	147
(b)-(k)	$a_y$ plots	148-157
24	$U_{de}$ Exceedances	
(a)	$U_{de}$ matrix	158
(b)-(k)	$U_{de}$ plots	159-168

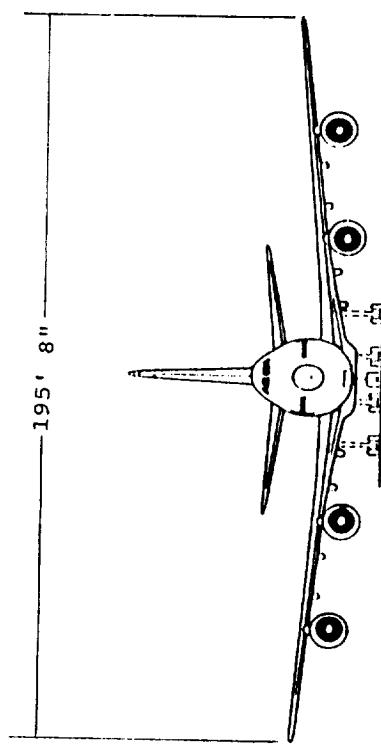
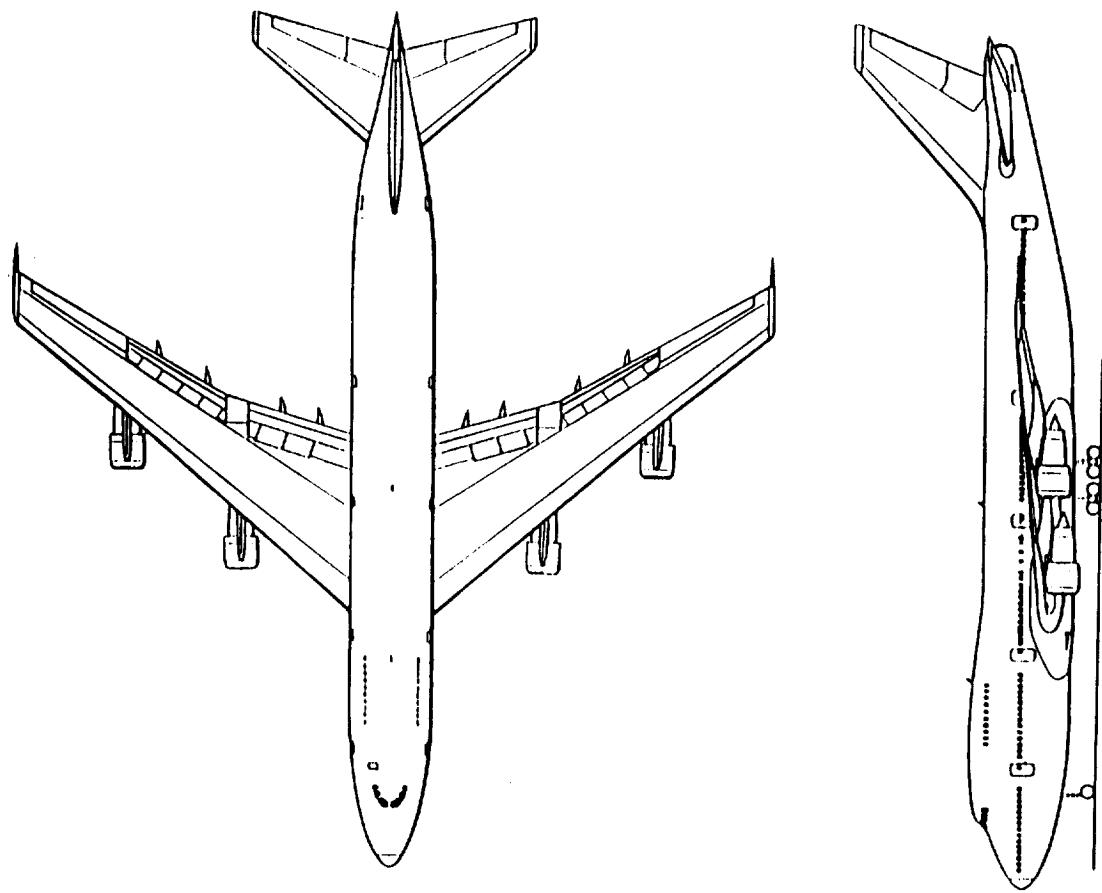


FIGURE 1.- Aircraft three view.

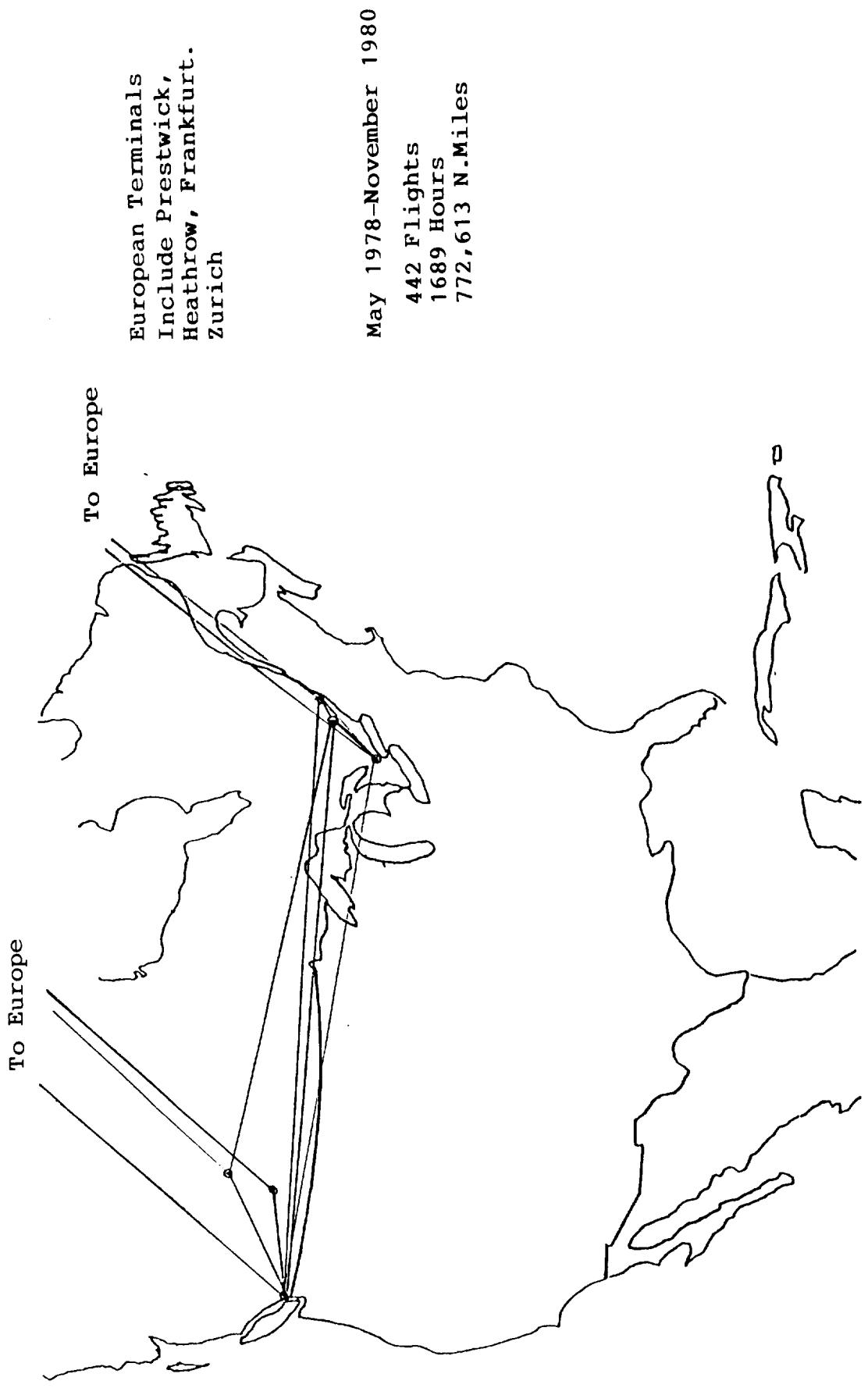


Figure 1. – Location of service area and scope of data.

DURATION OF FLIGHT, HOURS	PERCENT OF FLIGHTS									
	330 TO 370 KLBS	370 TO 410 KLBS	410 TO 450 KLBS	450 TO 490 KLBS	490 TO 530 KLBS	530 TO 570 KLBS	570 TO 610 KLBS	610 TO 650 KLBS	650 TO 690 KLBS	690 TO 730 KLBS
8.5-9.0	0	0	0	0	0	0	0	0	0	0.2
8.0-8.5	0	0	0	0	0	0	0	0.5	0	0.7
7.5-8.0	0	0	0	0	0	0	0	0.2	2.5	1.1
7.0-7.5	0	0	0	0	0	0	0	1.4	0.2	0.7
6.5-7.0	0	0	0	0	0	0	0	1.1	3.2	0.5
6.0-6.5	0	0	0	0	0	0	0.2	0.9	1.1	1.6
5.5-6.0	0	0	0	0	0	0	0	0.5	0.9	0
5.0-5.5	0	0	0	0	0	0.2	0.7	0.5	0	0
4.5-5.0	0	0	0	0	0	0	1.6	2.3	0.2	0
4.0-4.5	0	0	0	0	0.2	0.7	3.8	3.8	0.2	0
3.5-4.0	0	0	0	0	0.5	1.8	5.0	2.5	0.2	0
3.0-3.5	0	0	0	0	0.9	1.4	1.4	0	0	0
2.5-3.0	0	0	0	0.5	1.6	4.8	6.3	0.2	0	0
2.0-2.5	0	0	0	0	0.2	2.3	1.6	0	0	0
1.5-2.0	0	0	0	0	0	0	0	0	0	0
1.0-1.5	0	0	2.5	3.6	0.2	0.2	0	0	0	0
.5-1.0	0	2.7	8.6	6.8	1.6	0	0.2	0	0	0
.0-.5	0	0	0	0.7	0	0	0	0	0	0
TOTAL PERCENTS, ALL FLIGHTS	0	2.7	11.5	14.5	12.9	20.8	14.0	9.3	11.1	3.2

(a) Gross weight at take off

Figure 3.- Percent of flights; weight vs flight durations.

DURATION OF FLIGHT, HOURS	PERCENT OF FLIGHTS					
	330 KLBS	370 KLBS	410 KLBS	450 KLBS	490 KLBS	530 KLBS
8.5-9.0	0	0	0.7	1.6	0.2	0
8.0-8.5	0	0	0.5	2.3	0.2	0
7.5-8.0	0	0	1.1	2.7	1.8	0
7.0-7.5	0	0	1.6	1.1	1.1	0
6.5-7.0	0	0	1.6	3.6	1.4	0
6.0-6.5	0	0	0.5	1.8	1.6	0
5.5-6.0	0	0	0.5	0.5	0.9	0
5.0-5.5	0	0	0.7	0.7	0	0
4.5-5.0	0	0	0.5	3.4	0.2	0
4.0-4.5	0	0.2	1.4	5.2	2.0	0
3.5-4.0	0	0.5	1.8	5.9	1.8	0.2
3.0-3.5	0	0.7	1.1	1.8	0	0.2
2.5-3.0	0	0.9	2.7	8.1	1.6	0
2.0-2.5	0	0	0.5	2.7	0.9	0
1.5-2.0	0	0	0	0	0	0
1.0-1.5	0	0.9	3.2	2.3	0.2	0
.5-1.0	0.2	7.2	7.2	4.5	0.5	0
.0 -.5	0	0	0.2	0.5	0	0
TOTAL PERCENTS, ALL FLIGHTS	0.2	10.4	25.6	48.6	14.3	0.7
					0.2	0
					0	0

(b) Gross weight at landing

Figure 3.-Continued.

DURATION OF FLIGHT, HOURS	PERCENT OF FLIGHTS								
	30 KIAMS	60 KIAMS	90 KIAMS	120 KIAMS	150 KIAMS	180 KIAMS	210 KIAMS	240 KIAMS	270 KIAMS
8.5-9.0	0	0	0	0	0	0	0	0	0
8.0-8.5	0	0	0	0	0	0	0	0	0
7.5-8.0	0	0	0	0	0	0	0	0.2	0.5
7.0-7.5	0	0	0	0	0	0	0	1.6	5.0
6.5-7.0	0	0	0	0	0	0	0.2	2.0	0.5
6.0-6.5	0	0	0	0	0	0	0.2	5.4	0.2
5.5-6.0	0	0	0	0	0	0	0.9	2.9	0
5.0-5.5	0	0	0	0	0	0	0.9	0.9	0
4.5-5.0	0	0	0	0	0	0	0.5	0	0
4.0-4.5	0	0	0	0	0	0	0	0	0
3.5-4.0	0	0	0	0	0	0	0.5	0	0
3.0-3.5	0	0	0	0.5	0	0.2	0	0	0
2.5-3.0	0	0	0	7.0	5.0	1.4	0	0	0
2.0-2.5	0	0	0	2.3	1.4	0.5	0	0	0
1.5-2.0	0	0	0	0	0	0	0	0	0
1.0-1.5	0	4.3	2.0	0.2	0	0	0	0	0
.5-1.0	0	17.9	1.8	0	0	0.2	0	0	0
.0 -.5	0	0.7	0	0	0	0	0	0	0
TOTAL PERCENTS, ALL FLIGHTS	0	22.9	13.6	10.8	15.2	4.3	11.1	12.4	1.8

(c) Fuel weight at take off

Figure 3.- Continued.

DURATION OF FLIGHT, HOURS	PERCENT OF FLIGHTS											
	0 TO 30 KLBS	30 TO 60 KLBS	60 TO 90 KLBS	90 TO 120 KLBS	120 TO 150 KLBS	150 TO 180 KLBS	180 TO 210 KLBS	210 TO 240 KLBS	240 TO 270 KLBS	270 TO 300 KLBS	270 TO 300 KLBS	
8.5-9.0	1.8	0.7	0	0	0	0	0	0	0	0	0	
8.0-8.5	1.4	1.4	0.2	0	0	0	0	0	0	0	0	
7.5-8.0	1.4	4.3	0	0	0	0	0	0	0	0	0	
7.0-7.5	1.1	2.7	0	0	0	0	0	0	0	0	0	
6.5-7.0	2.0	4.5	0	0	0	0	0	0	0	0	0	
6.0-6.5	1.1	2.7	0	0	0	0	0	0	0	0	0	
5.5-6.0	0.7	1.1	0	0	0	0	0	0	0	0	0	
5.0-5.5	0.7	0.7	0	0	0	0	0	0	0	0	0	
4.5-5.0	1.6	2.5	0	0	0	0	0	0	0	0	0	
4.0-4.5	4.5	4.3	0	0	0	0	0	0	0	0	0	
3.5-4.0	4.8	5.0	0.5	0	0	0	0	0	0	0	0	
3.0-3.5	1.1	2.3	0.2	0	0	0	0	0	0	0	0.2	
2.5-3.0	5.9	6.1	1.4	0	0	0	0	0	0	0	0	
2.0-2.5	1.6	1.8	0.7	0	0	0	0	0	0	0	0	
1.5-2.0	0	0	0	0	0	0	0	0	0	0	0	
1.0-1.5	3.8	2.5	0.2	0	0	0	0	0	0	0	0	
.5-1.0	12.7	7.0	0	0	0	0	0	0.2	0	0	0	
.0 -.5	0.5	0.2	0	0	0	0	0	0	0	0	0	
TOTAL PERCENTS, ALL FLIGHTS	46.6	49.8	3.2	0	0.2	0.2	0	0	0	0	0	

(d) Fuel weight at landing

Figure 3.- Continued.

DURATION OF FLIGHT, HOURS	PERCENT OF FLIGHTS								
	25 KLBS	50 KLBS	75 KLBS	100 KLBS	125 KLBS	150 KLBS	175 KLBS	200 KLBS	225 KLBS
8.5-9.0	0	0	0	0	0	0	0	0	1.6
8.0-8.5	0	0	0	0	0	0	0	1.1	0
7.5-8.0	0	0	0	0	0	0	0.7	4.3	0.7
7.0-7.5	0	0	0	0	0	0	1.6	2.0	0.2
6.5-7.0	0	0	0	0	0.2	0.2	5.7	0.2	0.2
6.0-6.5	0	0	0	0	0	0	1.4	2.5	0
5.5-6.0	0	0	0	0	0	0	1.1	0.7	0
5.0-5.5	0	0	0	0	0	1.1	0.2	0	0
4.5-5.0	0	0	0	0	0.5	3.6	0	0	0
4.0-4.5	0	0	0.2	5.7	2.9	0	0	0	0
3.5-4.0	0	0	0.5	9.5	0.2	0	0	0	0
3.0-3.5	0	0	3.2	0.7	0	0	0	0	0
2.5-3.0	0	0	13.3	0	0	0	0	0	0
2.0-2.5	0	0.7	3.4	0	0	0	0	0	0
1.5-2.0	0	0	0	0	0	0	0	0	0
1.0-1.5	2.0	4.5	0	0	0	0	0	0	0
.5-1.0	18.8	1.1	0	0	0	0	0	0	0
.0 -.5	0.7	0	0	0	0	0	0	0	0
TOTAL PERCENTS, ALL FLIGHTS	21.5	6.3	20.6	16.3	8.1	2.9	11.1	8.6	4.5

(e) Fuel burn vs flight duration

Figure 3.- Continued.

		PERCENT OF FLIGHTS									
		0 TO 20 KIAMS	20 TO 40 KIAMS	40 TO 60 KIAMS	60 TO 80 KIAMS	80 TO 100 KIAMS	100 TO 120 KIAMS	120 TO 140 KIAMS	140 TO 160 KIAMS	160 TO 180 KIAMS	180 TO 200 KIAMS
DURATION OF FLIGHT, HOURS											
8.5-9.0	0	0.5	0.2	0.5	0.5	1.4	0	0	0	0	0
8.0-8.5	0.2	0.2	0.2	0.2	0.2	2.0	0	0	0	0	0
7.5-8.0	0	0.2	1.4	1.6	1.1	1.4	0	0	0	0	0
7.0-7.5	0	0.5	0.9	0.2	1.6	1.6	0	0	0	0	0
6.5-7.0	0	0	1.4	1.8	2.5	0.9	0	0	0	0	0
6.0-6.5	0	0.2	0.2	1.4	0.2	1.1	0.7	0	0	0	0
5.5-6.0	0	0	0	0	0.9	0	0.5	0.5	0	0	0
5.0-5.5	0	0.2	0.5	0.5	0.5	0.2	0	0	0	0	0
4.5-5.0	0	0.2	0	2.0	2.0	1.6	0.2	0	0	0	0
4.0-4.5	0.2	0.2	1.4	2.3	3.2	1.4	0	0	0	0	0
3.5-4.0	0.5	0.7	1.1	3.4	2.7	1.8	0	0	0	0	0
3.0-3.5	0.5	1.1	0.7	1.4	0.2	0	0	0	0	0	0
2.5-3.0	0.9	1.8	2.0	3.2	5.2	0.2	0	0	0	0	0
2.0-2.5	0	0	0.9	1.8	1.4	0	0	0	0	0	0
1.5-2.0	0	0	0	0	0	0	0	0	0	0	0
1.0-1.5	0.9	2.0	2.5	0.7	0.5	0	0	0	0	0	0
.5-1.0	5.7	6.1	3.6	2.3	2.0	0.2	0	0	0	0	0
.0 -.5	0	0	0.2	0.2	0.2	0	0	0	0	0	0
TOTAL PERCENTS, ALL FLIGHTS	8.8	14.0	17.2	24.2	26.0	8.4	1.4	0	0	0	0

(f) Payload weight vs flight duration

Figure 3.- Concluded.

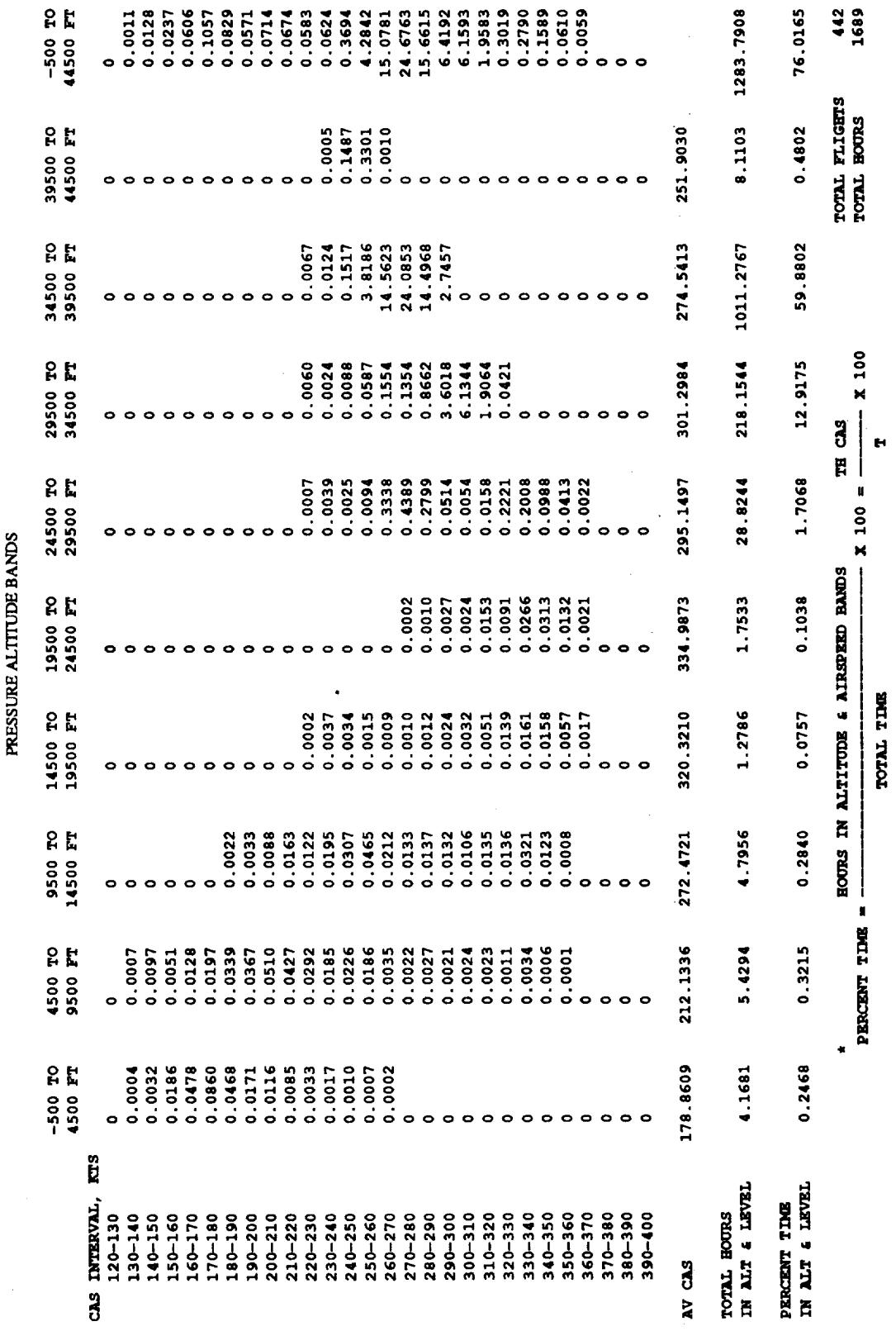
**ORIGINAL PAGE IS  
OF POOR QUALITY**

Figure 4.- Percent time in altitude and gross weight bands.

PRESSURE ALTITUDE BANDS									
CAS INTERVAL, KTS	-500 TO 4500 FT	4500 TO 9500 FT	9500 TO 14500 FT	14500 TO 19500 FT	19500 TO 24500 FT	24500 TO 29500 FT	29500 TO 34500 FT	34500 TO 39500 FT	39500 TO 44500 FT
120-130	0.0016	0	0	0	0	0	0	0	0.0016
130-140	0	0	0	0	0	0	0	0	0
140-150	0.0077	0.0004	0	0	0	0	0	0	0.0081
150-160	0.0603	0.0013	0	0	0	0	0	0	0.0617
160-170	0.0844	0.0020	0	0	0	0	0	0	0.0864
170-180	0.0779	0.0011	0	0	0	0	0	0	0.0820
180-190	0.0627	0.0078	0	0.0020	0	0	0	0	0.0705
190-200	0.0764	0.0120	0	0.0005	0	0	0	0	0.0892
200-210	0.1095	0.0175	0	0.0008	0	0	0	0	0.1270
210-220	0.1167	0.0245	0	0.0013	0	0	0	0	0.1412
220-230	0.1207	0.0453	0.0008	0.0026	0	0	0	0	0.1668
230-240	0.1086	0.0650	0.0050	0.0024	0	0.0024	0.0008	0	0.1939
240-250	0.1232	0.3204	0.0589	0.0094	0.0101	0.0150	0.0119	0.0070	0.5763
250-260	0.0753	0.4540	0.1404	0.0054	0.0008	0.0024	0.0074	0.1936	0.8964
260-270	0.0081	0.1013	0.1250	0.0155	0.0110	0.0110	0.0093	0.5933	0.0013
270-280	0.0014	0.0282	0.1160	0.0218	0.0230	0.0140	0.0916	0.8085	0.8757
280-290	0.0004	0.0188	0.1365	0.0438	0.0405	0.0383	0.4892	0.4407	1.1045
290-300	0	0.0242	0.3145	0.5484	0.7125	0.7924	1.0504	0.0521	0
300-310	0	0.0238	0.2453	0.3638	0.4197	0.4516	0.5069	0	2.0111
310-320	0	0.0175	0.1449	0.3018	0.3908	0.5005	0.1441	0	1.4946
320-330	0	0.0080	0.0860	0.1531	0.1869	0.1930	0.0013	0	0.6414
330-340	0	0.0113	0.0109	0.0089	0.0123	0.0243	0	0	0.0589
340-350	0	0.0015	0.0027	0.0037	0.0089	0.0100	0	0	0.0268
350-360	0	0.0004	0.0005	0.0007	0.0040	0.0050	0	0	0.0107
360-370	0	0.0004	0	0	0	0	0	0	0.0005
370-380	0	0.0001	0	0	0	0	0	0	0.0001
380-390	0	0	0	0	0	0	0	0	0
390-400	0	0	0	0	0	0	0	0	0
AV CAS	209.6386	252.0451	289.3584	303.5816	304.2868	305.0667	272.6291	252.7250	
TOTAL HOURS IN ALT & CLIMB	17.4792	19.9560	23.4294	24.9742	30.7847	34.7896	39.3981	35.6275	0.4283 226.8669
PERCENT TIME IN ALT & CLIMB	1.0350	1.1816	1.3873	1.4788	1.8228	2.0600	2.3329	2.1096	0.0254 13.4334
* PERCENT TIME = $\frac{\text{HOURS IN ALTITUDE \& AIRSPEED BANDS}}{\text{TOTAL TIME}}$ X 100 = $\frac{\text{TH CAS}}{\text{T}}$ X 100									

(a) Climb

Figure 5.- Percent time in altitude and airspeed bands.



(b) Level

Figure 5.- Continued.

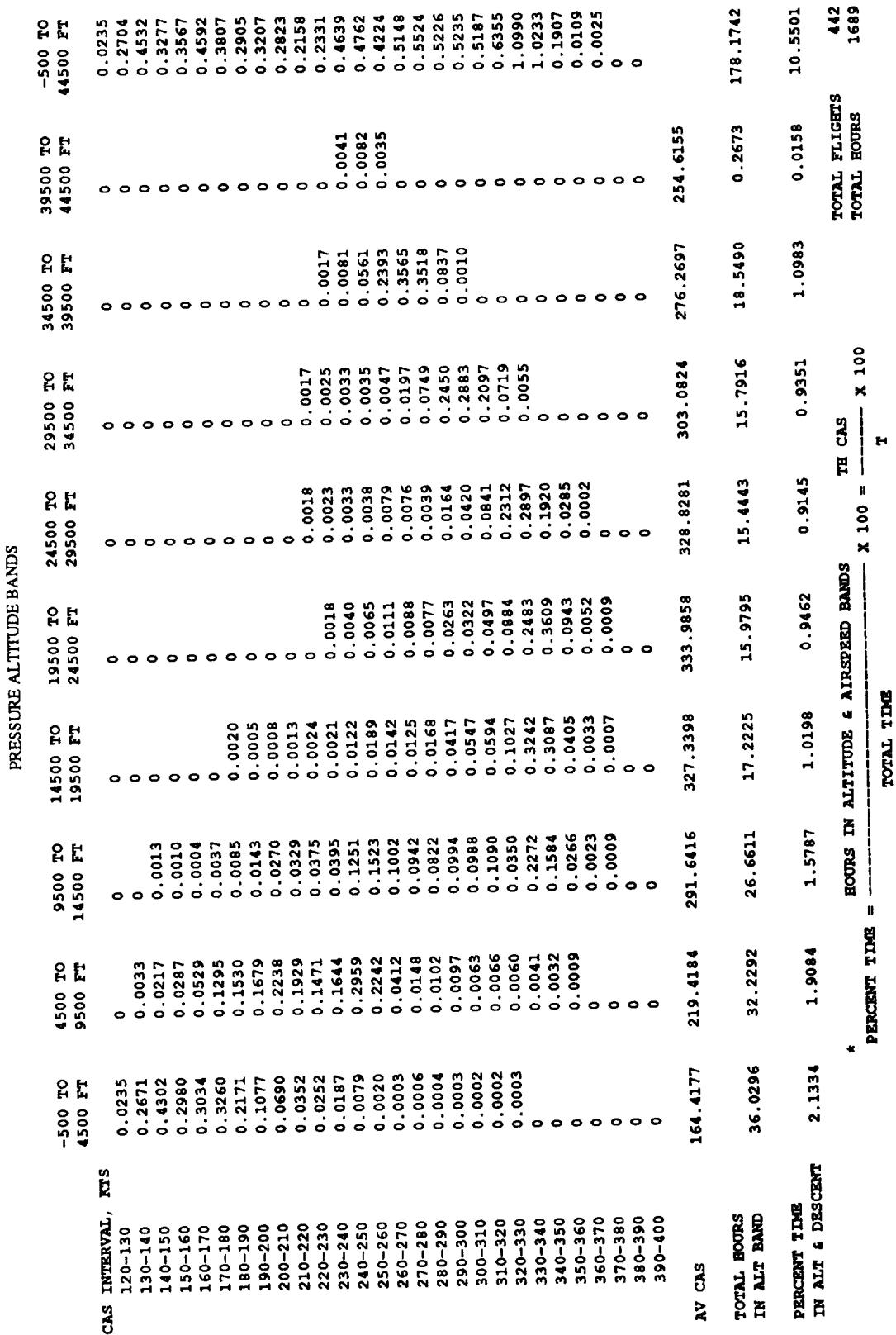


Figure 5.-Continued.

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PRESSURE ALTITUDE BANDS									
CAS INTERVAL, KTS	4500 FT	9500 FT	14500 FT	19500 FT	24500 FT	29500 FT	34500 FT	39500 FT	-500 TO 44500 FT
-500 TO 120-130	0.0251	0	0	0	0	0	0	0	0
130-140	0.2675	0.0041	0	0	0	0	0	0	0.0251
140-150	0.4410	0.0318	0.0013	0	0	0	0	0	0.2715
150-160	0.3770	0.0351	0.0010	0	0	0	0	0	0.4741
160-170	0.4356	0.0677	0.0004	0	0	0	0	0	0.4131
170-180	0.4899	0.1533	0.0037	0	0	0	0	0	0.5037
180-190	0.3266	0.1984	0.0108	0.0020	0	0	0	0	0.6469
190-200	0.2012	0.2174	0.0176	0.0005	0	0	0	0	0.5341
200-210	0.1902	0.2923	0.0359	0.0008	0	0	0	0	0.4368
210-220	0.1603	0.2601	0.0492	0.0013	0	0	0	0	0.5192
220-230	0.1492	0.2216	0.0506	0.0026	0	0.0026	0.0076	0.0067	0.4709
230-240	0.1290	0.2489	0.0640	0.0082	0.0041	0.0086	0.0112	0.0150	0.4409
240-250	0.1321	0.6389	0.2148	0.0250	0.0140	0.0240	0.0240	0.1802	0.4894
250-260	0.0780	0.6968	0.3401	0.0257	0.0074	0.0156	0.0696	0.1598	1.4096
260-270	0.0087	0.1460	0.2463	0.0306	0.0222	0.0222	0.0226	0.0683	5.6568
270-280	0.0020	0.0452	0.2236	0.0353	0.0320	0.0320	0.1606	0.3554	15.3949
280-290	0.0008	0.0317	0.2324	0.0619	0.0492	0.2221	0.4348	0.2504	0.0057
290-300	0.0003	0.0360	0.4271	0.5925	0.7415	0.8602	4.8972	2.8815	16.3764
300-310	0.0002	0.3250	0.3547	0.4217	0.4543	0.1989	6.9296	0.0019	8.6939
310-320	0.0002	0.0264	0.2673	0.3663	0.4557	0.5004	2.2602	0	3.9765
320-330	0.0003	0.0150	0.2346	0.2698	0.2844	0.6463	0.1284	0	1.5788
330-340	0	0.0088	0.2702	0.3492	0.2873	0.5147	0.0068	0	1.4369
340-350	0	0.0053	0.1734	0.3282	0.4012	0.3008	0	0	1.2089
350-360	0	0.0014	0.0279	0.0470	0.1114	0.0748	0	0	0.2624
360-370	0	0.0004	0.0023	0.0050	0.0073	0.0024	0	0	0.0173
370-380	0	0.0001	0.0009	0.0007	0.0009	0	0	0	0.0026
380-390	0	0	0	0	0	0	0	0	0
390-400	0	0	0	0	0	0	0	0	0
AV CAS	179.1658	230.0328	288.9921	313.4856	315.1778	305.9575	300.5032	274.5074	252.0253
TOTAL HOURS IN ALT BAND	57.6768	57.6147	54.8861	43.4753	48.5176	79.0583	273.3441	1065.4532	8.8058 1688.8319
PERCENT TIME IN ALT AND DESCENT	3.4152	3.4115	3.2499	2.5743	2.8728	4.6812	16.1854	63.0882	0.5214 100.0000
* PERCENT TIME = $\frac{\text{HOURS IN ALTITUDE & AIRSPEED BANDS}}{\text{TOTAL TIME}}$	X 100 = $\frac{\text{TH CAS}}{\text{T}}$								

(d) All flight modes

Figure 5.- Concluded.

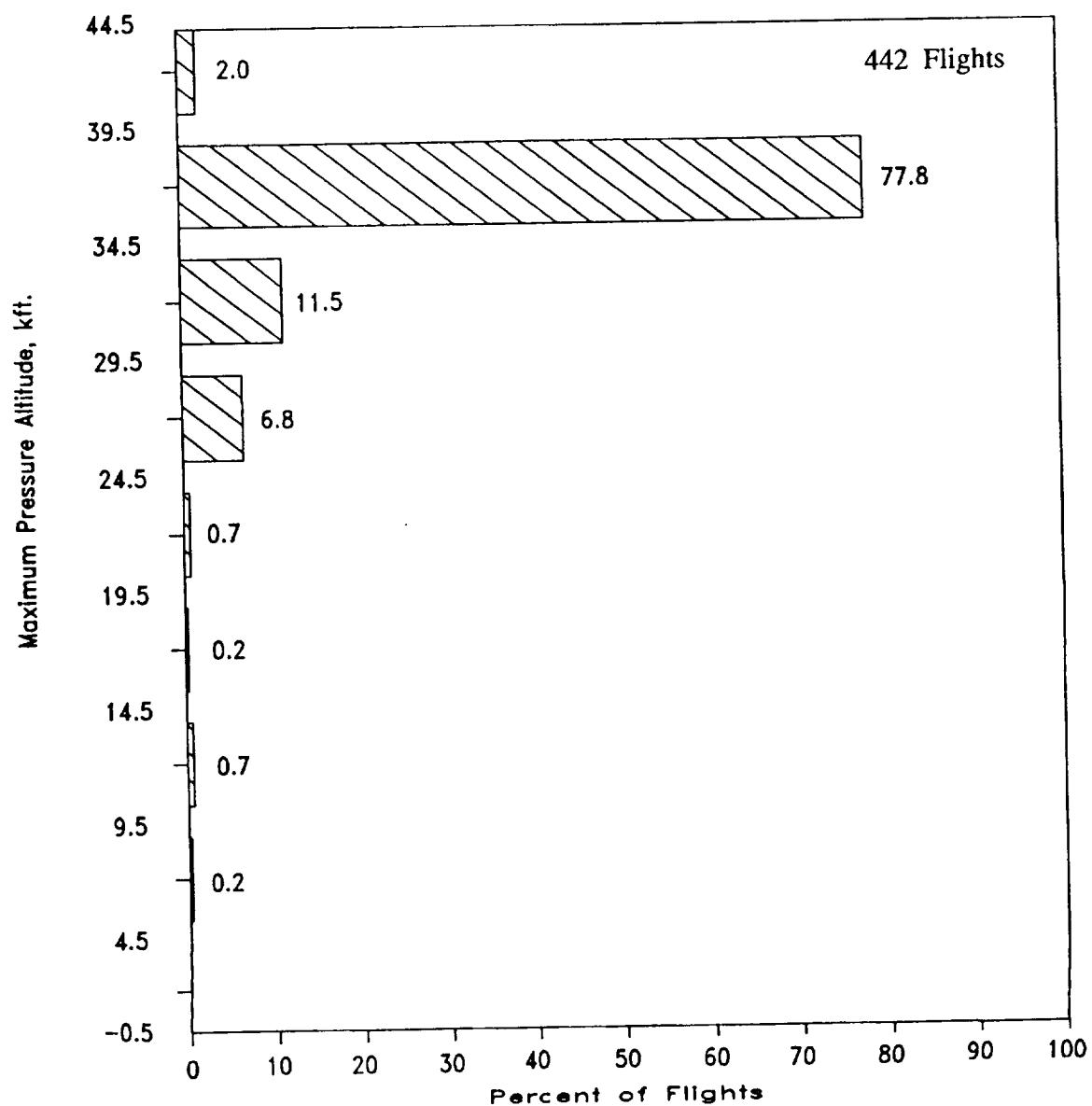
PRESSURE ALTITUDE BANDS									
TIME INTERVAL, HRS IN ALTITUDE BAND	-500 TO 4500 FT	4500 TO 9500 FT	9500 TO 14500 FT	14500 TO 19500 FT	19500 TO 24500 FT	24500 TO 29500 FT	29500 TO 34500 FT	34500 TO 39500 FT	39500 TO 44500 FT
8.50-9.00	0	0	0	0	0	0	0	0	0
8.00-8.50	0	0	0	0	0	0	0	0	0
7.50-8.00	0	0	0	0	0	0	0	0	0
7.00-7.50	0	0	0	0	0	0	0	0.226	0.679
6.50-7.00	0	0	0	0	0	0	0	0	0
6.00-6.50	0	0	0	0	0	0	0	0.226	0.226
5.50-6.00	0	0	0	0	0	0	0	0	0
5.00-5.50	0	0	0	0	0	0	0	1.357	3.394
4.50-5.00	0	0	0	0	0	0	0	1.131	2.036
4.00-4.50	0	0	0	0	0	0	0	2.036	2.036
3.50-4.00	0	0	0	0	0	0	0	0.679	8.371
3.00-3.50	0	0	0	0	0	0	0	0.226	1.357
2.50-3.00	0	0	0	0	0	0	0	0.226	6.787
2.00-2.50	0	0	0	0	0	0	0	1.131	7.919
1.50-2.00	0	0	0	0	0	0	0	2.036	14.253
1.00-1.50	0	0	0	0	0	0	0	3.846	2.489
.80-1.00	0	0	0	0	0	0	0	0.679	1.131
.70-.80	0	0	0	0	0	0	0	1.810	0.226
.60-.70	0	0	0	0	0	0	0	0.679	0.226
.50-.60	0	0.452	0	0	0	0	0.905	2.715	1.810
.40-.50	0	0	0	0	0	0	0.679	2.262	2.941
.30-.40	0	0.679	0.226	0	0	0	2.489	3.846	0
.20-.30	3.167	4.751	2.941	2.036	2.036	6.787	8.145	1.131	0.679
.15-.20	24.387	15.385	12.443	2.489	6.109	13.575	11.086	0.452	0
.10-.15	51.357	57.692	64.027	35.520	48.416	47.059	35.973	0	0
.05-.10	18.778	21.041	20.136	59.050	42.081	25.339	10.181	0	0
.00-.05	1.810	0	0	0	0	0.226	0	0	0
TOTAL HOURS IN ALT BAND	57.6768	57.6147	54.8861	43.4753	48.5176	79.0583	273.3441	1065.4532	8.8058
TOTAL PERCENT TIME IN ALT BAND	3.4152	3.4115	3.2499	2.5743	2.8728	4.6812	16.1854	63.0882	0.5214

Figure 6.- Percent of flights vs time in altitude bands.

		PERCENT OF FLIGHTS									
		TO MAXIMUM PRESSURE ALTITUDE BAND IN EACH FLIGHT VS DURATION									
		-500 TO 4500 FT	4500 TO 9500 FT	9500 TO 14500 FT	14500 TO 19500 FT	19500 TO 24500 FT	24500 TO 29500 FT	29500 TO 34500 FT	34500 TO 39500 FT	39500 TO 44500 FT	44500 TO 39500 FT
DURATION OF FLIGHT, HOURS											
8.5-9.0	0	0	0	0	0	0	0.2	0	2.3	0	
8.0-8.5	0	0	0	0	0	0	0	0	2.9	0	
7.5-8.0	0	0	0	0	0	0	0	0	5.4	0.2	
7.0-7.5	0	0	0	0	0	0	0	0	3.8	0	
6.5-7.0	0	0	0	0	0	0.2	0	0	6.3	0	
6.0-6.5	0	0	0	0	0	0	0.5	0	3.4	0	
5.5-6.0	0	0	0	0	0	0	0	0.2	1.6	0	
5.0-5.5	0	0	0	0	0	0	0	0	0.9	0.5	
4.5-5.0	0	0	0	0	0	0	0	0	4.1	0	
4.0-4.5	0	0	0	0	0	0	0.2	0.2	6.4	0.2	
3.5-4.0	0	0	0	0	0	0.2	0.2	0.2	8.8	0.9	
3.0-3.5	0	0	0	0	0	0	0.5	0.5	3.2	0.2	
2.5-3.0	0	0	0	0	0	0.2	0	0	13.1	0	
2.0-2.5	0	0	0	0	0	0	0	0	4.1	0	
1.5-2.0	0	0	0	0	0	0	0	0	0	0	
1.0-1.5	0	0	0	0	0	0	1.1	1.1	5.4	0	
.5-1.0	0	0.2	0.2	0	0.7	5.9	8.8	4.1	0	0	
.0-.5	0	0	0.5	0.2	0	0	0	0	0	0	
TOTAL PERCENTS, ALL FLIGHTS	0	0.2	0.7	0.2	0.7	6.8	11.5	77.8	2.0		

(a) Maximum altitude vs flight duration matrix

Figure 7.- Percent of flights to maximum altitude.



(b) Percent of flights to maximum pressure altitude per flight : Plot.

Figure 7.- Concluded.

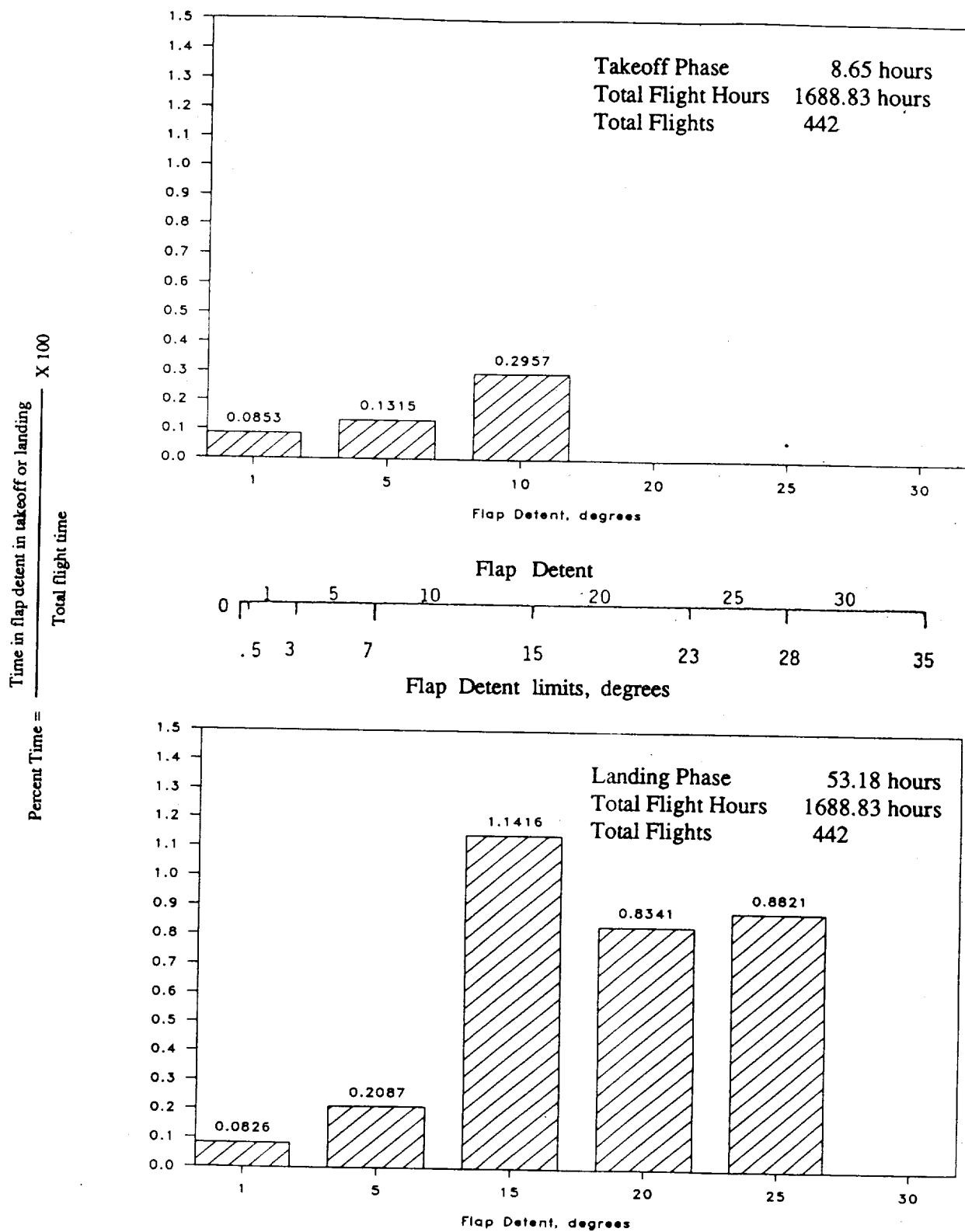
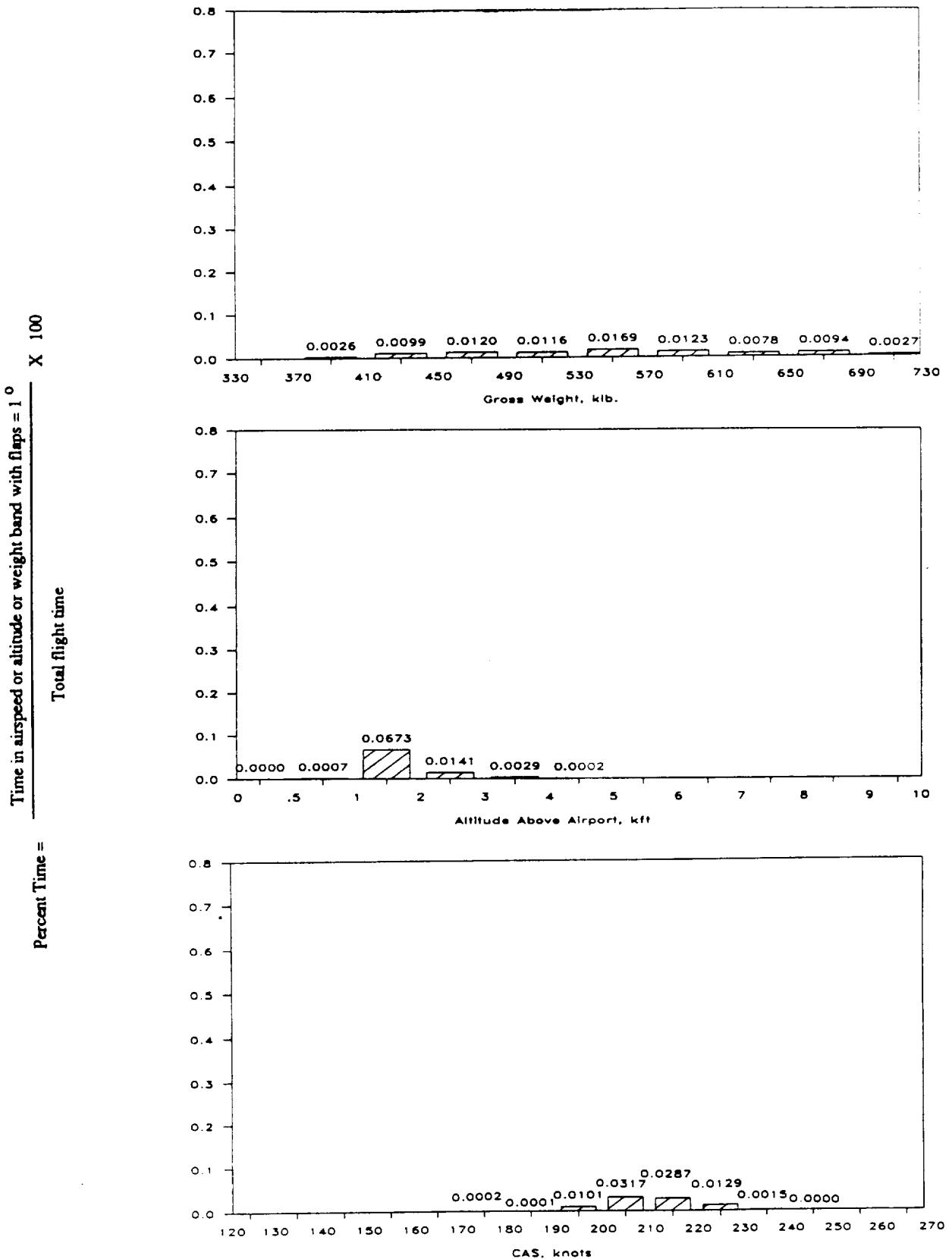
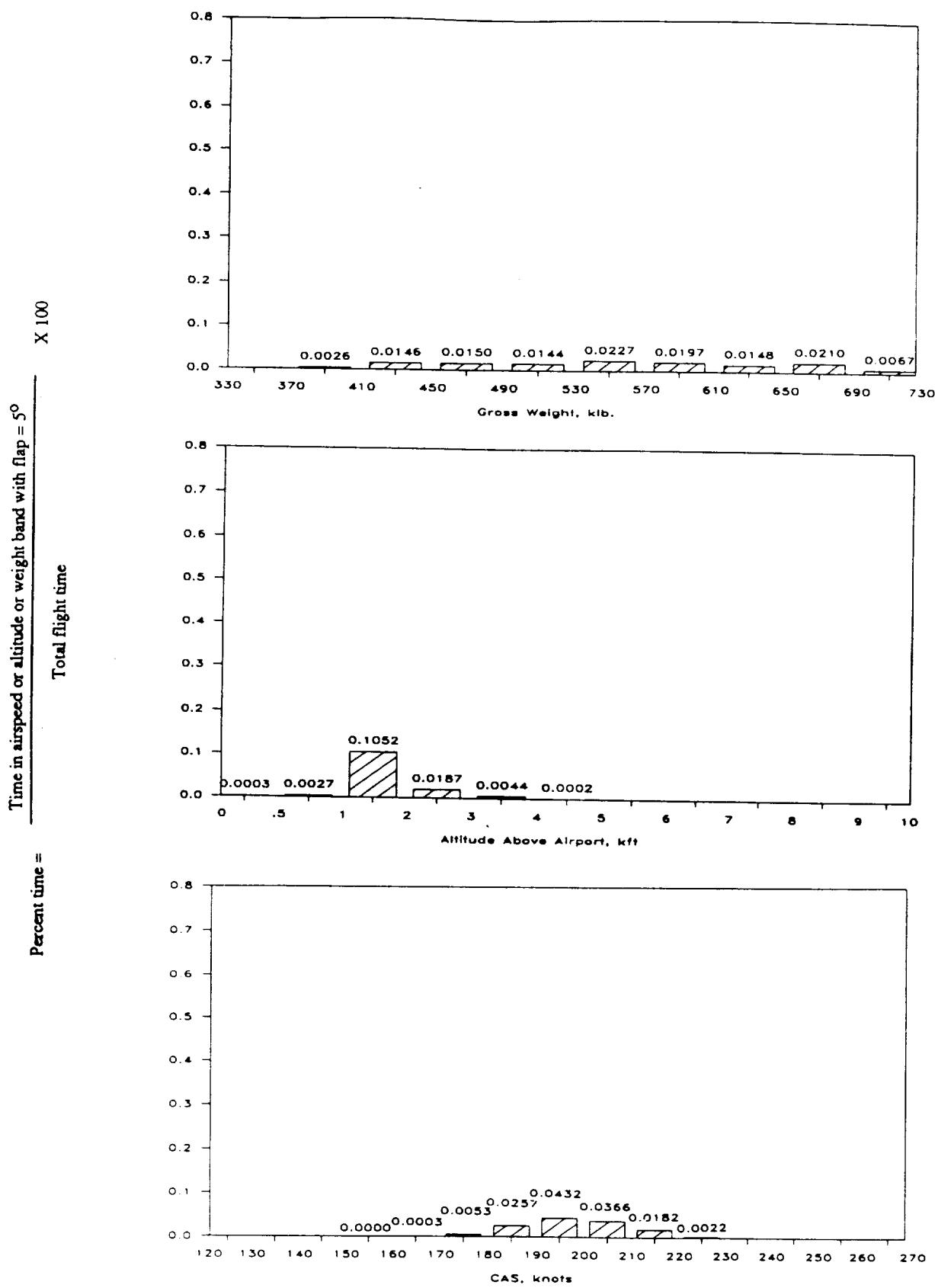


Figure 8.- Percent of total flight time at each flap detent.



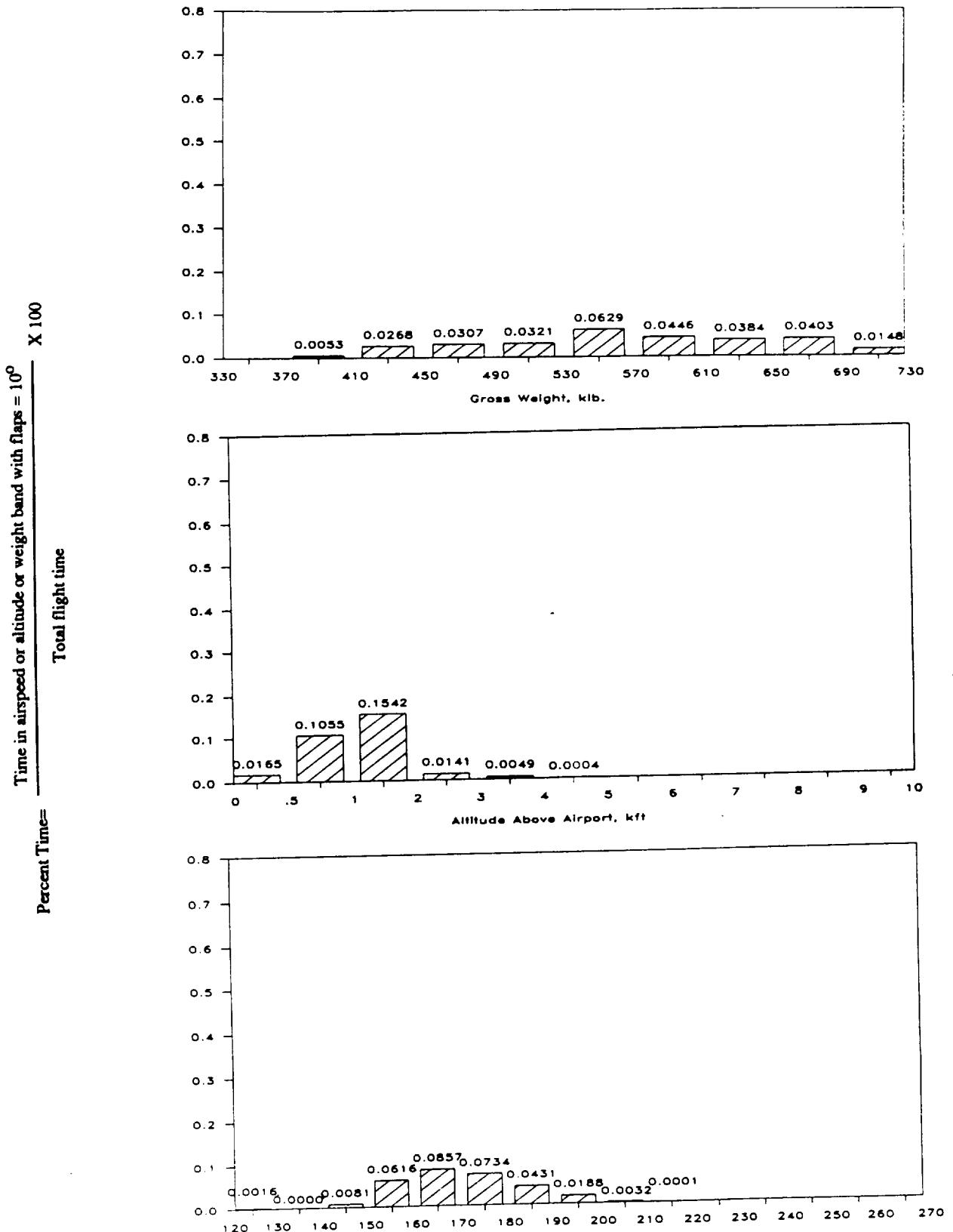
(a) Takeoff, flaps=1°; 1.4399 hours

Figure 9.- Gross weight, altitude above airport, and airspeed time distributions.



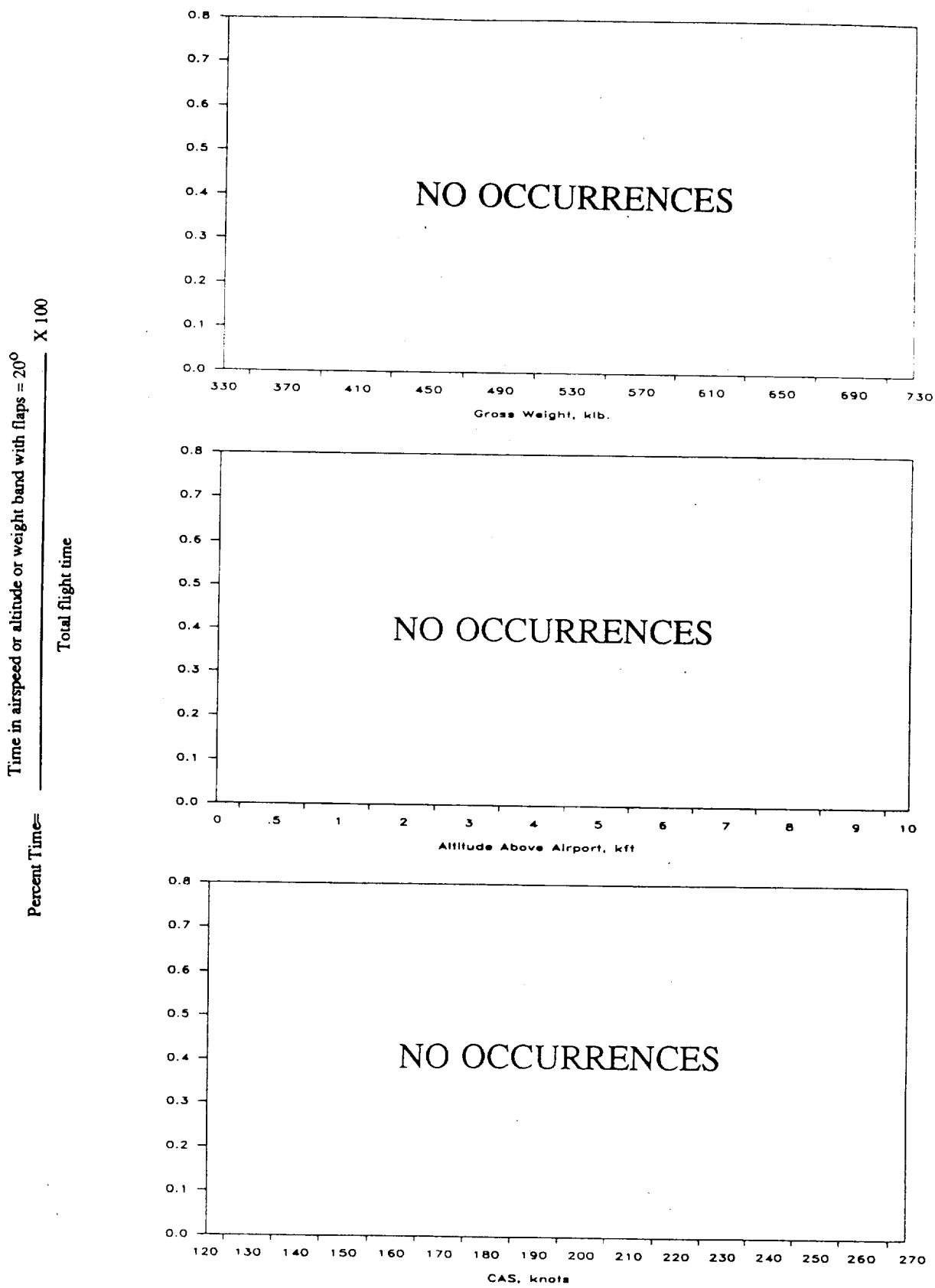
(b) Takeoff, flaps=5°; 2.2216 hours

Figure 9.- Continued.



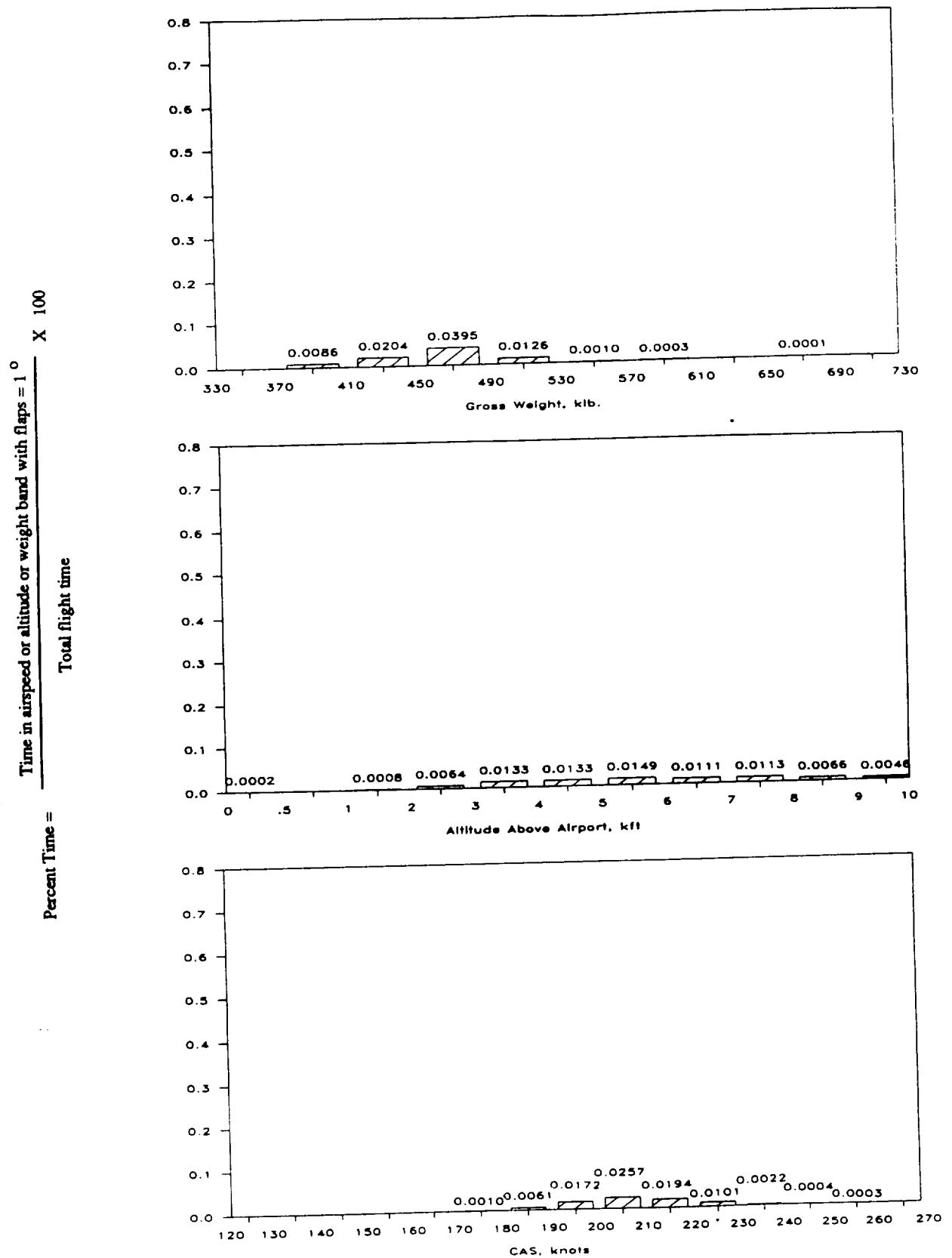
(c) Takeoff, flaps=10°; 4.9931 hours

Figure 9.- Continued.



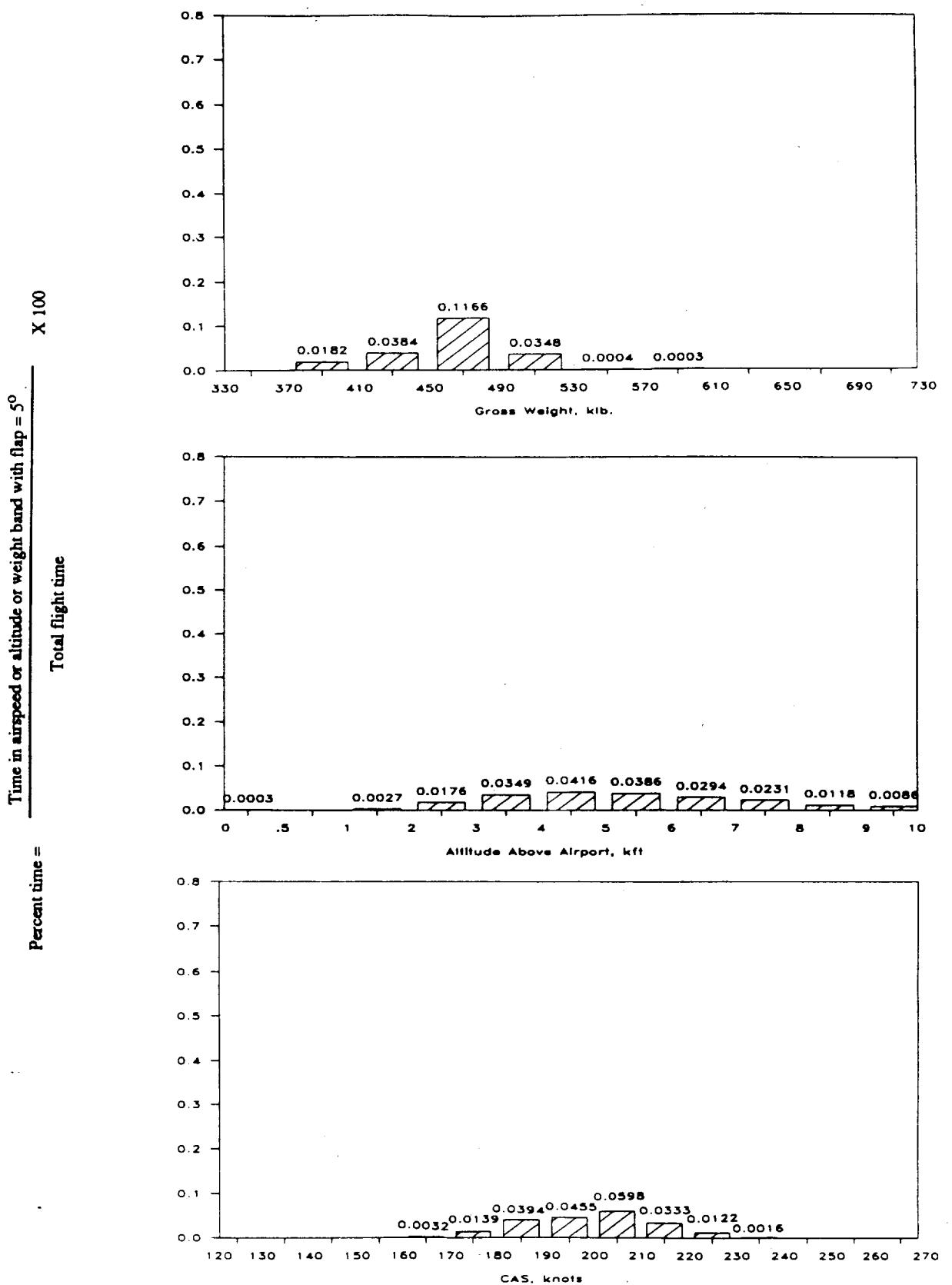
(d) Takeoff, flaps= $20^{\circ}$ ; 0.0000 hours

Figure 9.- Continued.



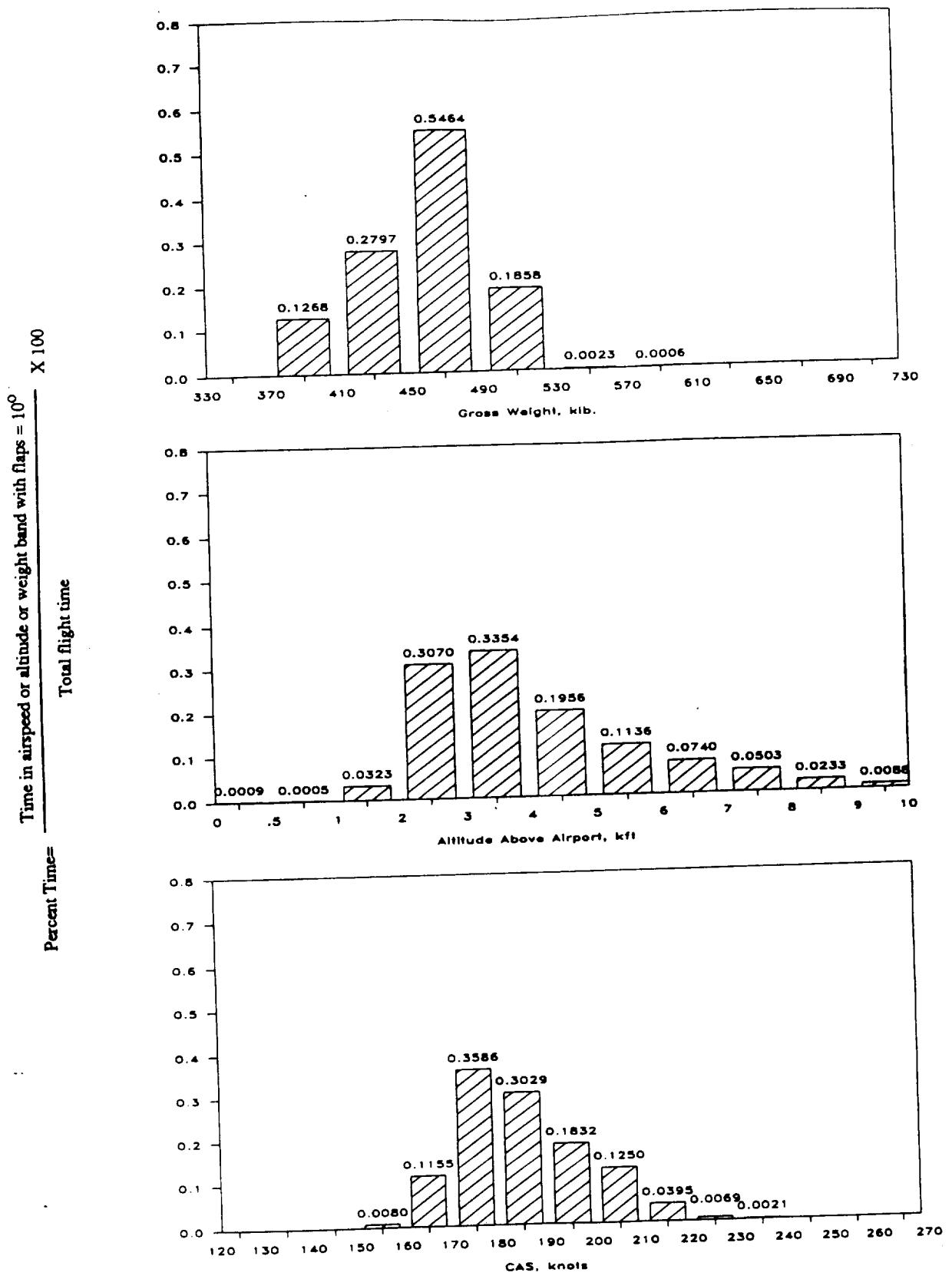
(e) Landing, flaps=1°; 1.3944 hours

Figure 9.- Continued.



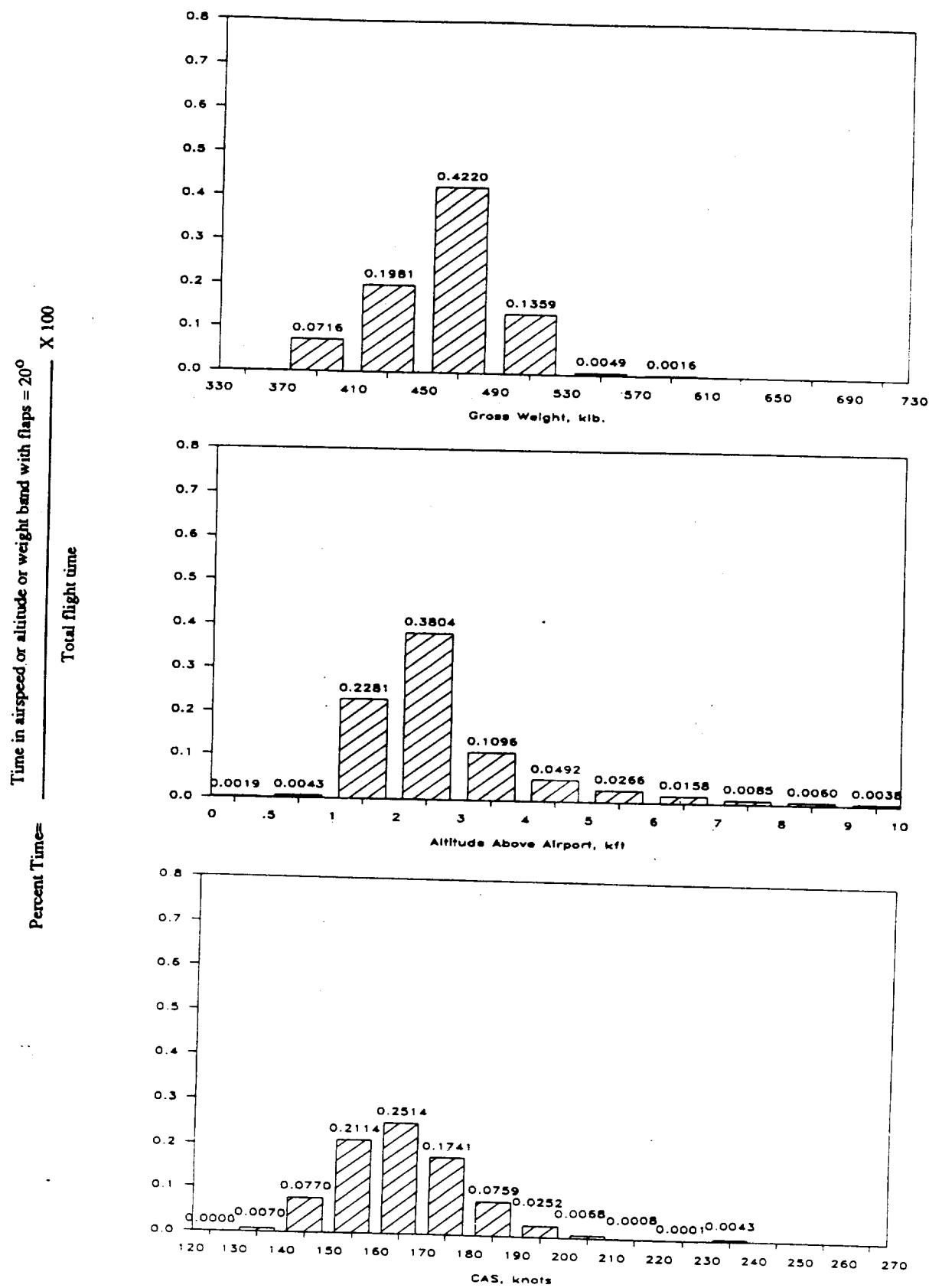
(f) Landing, flaps=5°; 3.5252 hours

Figure 9.- Continued.



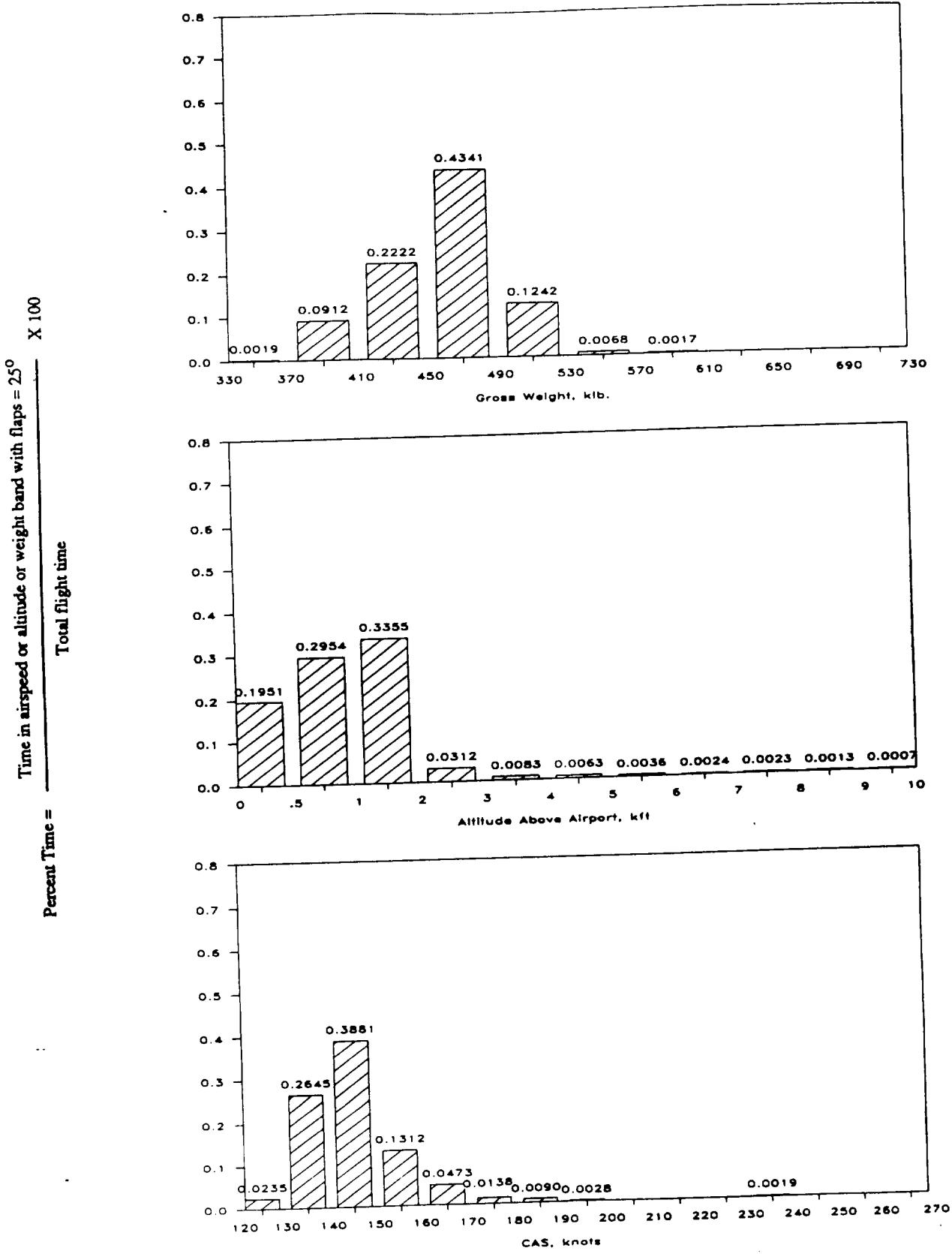
(g) Landing, flaps= $10^0$ ; 19.2804 hours

Figure 9.- Continued.



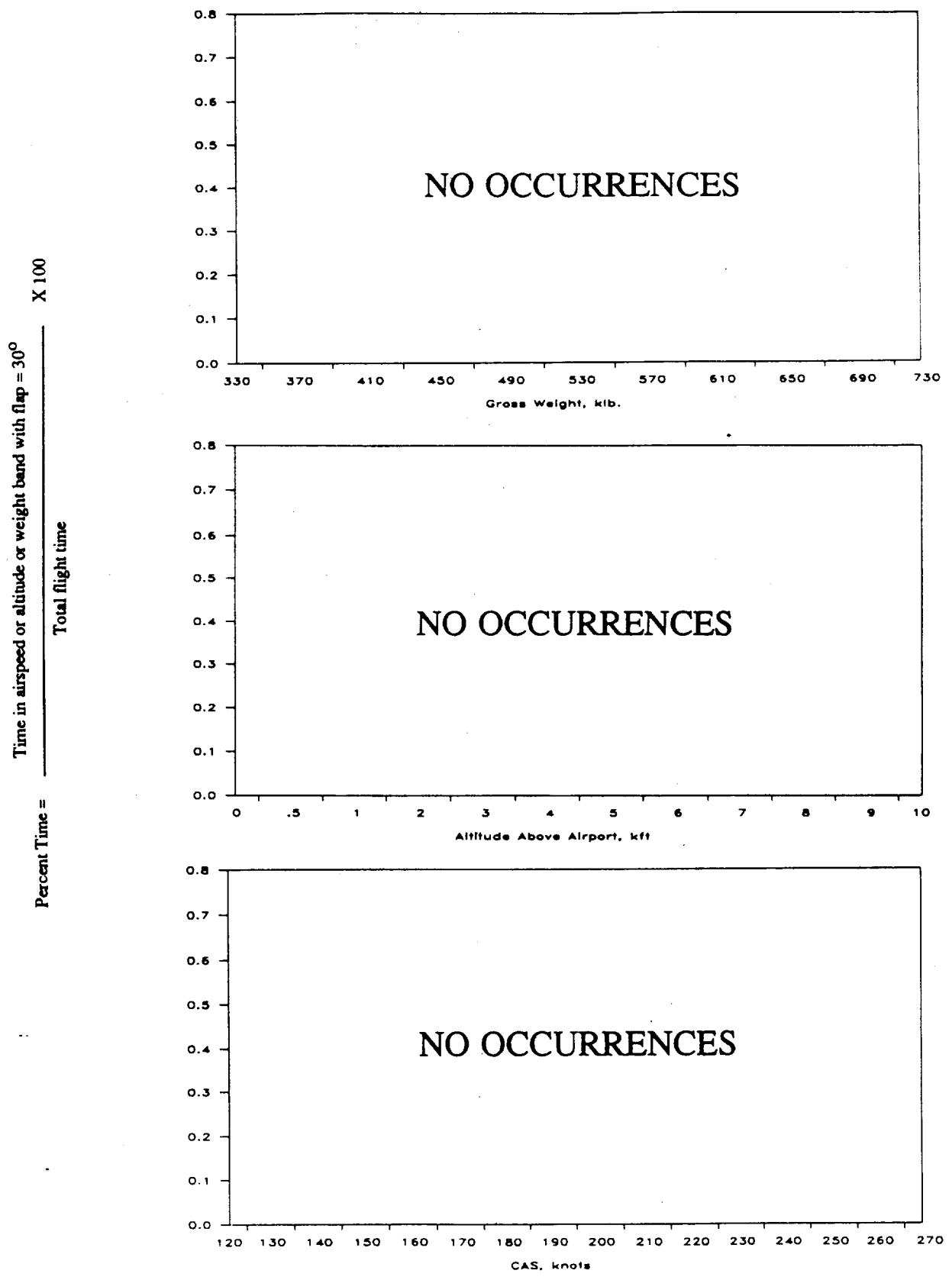
(h) Landing, flaps=20°; 14.0867 hours

Figure 9.- Continued.



(i) Landing, flaps=25°; 14.8968 hours

Figure 9.- Continued.



(j) Landing, flaps= $30^\circ$ ; 0.0000 hours

Figure 9.- Concluded.

## FLAP DEFLECTION, DEGREES

TIME AFTER LIFTOFF	MINUTES	28.0	23.0	15.0	7.0	3.0	0.5	NOTES
0.0 - .1		0	0	0	1.1	0	0.2	1. 442 flights
.1 - .2		0	0	0	0.2	0	0	2. The first 15 seconds
.2 - .3		0	0	0	4.3	0.9	0	after takeoff on each
.3 - .4		0	0	0	10.2	0.7	0	flight are not included.
.4 - .5		0	0	0	15.2	3.8	1.1	
.5 - .6		0	0	0	16.5	10.0	0.9	
.6 - .8		0	0	0	32.4	24.9	13.3	3. Flap deflections less
.8 - 1.0		0	0	0	11.1	25.3	25.6	than 0.5 degrees were
1.0 - 1.2		0	0	0	4.3	15.2	25.6	considered to be zero.
1.2 - 1.4		0	0	0	0.9	8.4	14.3	
1.4 - 1.6		0	0	0	0.5	3.2	8.1	
1.6 - 1.8		0	0	0	0.7	2.3	3.2	
1.8 - 2.0		0	0	0	0.2	1.1	2.3	
2.0 - 2.2		0	0	0	0.7	0.2	1.1	
2.2 - 2.4		0	0	0	0.2	0.5	0.2	
2.4 - 2.6		0	0	0	0.2	0.9	0.5	
2.6 - 2.8		0	0	0	0	0.7	0.7	
2.8 - 3.0		0	0	0	0	0.7	0	
3.0 - 3.5		0	0	0	0	0.5	0.2	
3.5 - 4.0		0	0	0	0	0	0.2	
4.0 - 4.5		0	0	0	0	0	0	
4.5 - 5.0		0	0	0	0	0	0	
5.0 - 6.0		0	0	0	0	0	0	
6.0 - 7.0		0	0	0	0	0	0	
7.0 - 8.0		0	0	0	0	0	0	
8.0 - 9.0		0	0	0	0	0	0	
9.0 - 10.0		0	0	0	0	0	0	
10.0 - 15.0		0	0	0	0	0	0	
15.0 - 20.0		0	0	0	0	0	0	
20.0 - 25.0		0	0	0	0	0	0	
0.0 - 25.0		0	0	0	0	99.3	99.3	

(a) Take off: Percent of flights vs times when take off flap deflection is reduced to less than indicated values

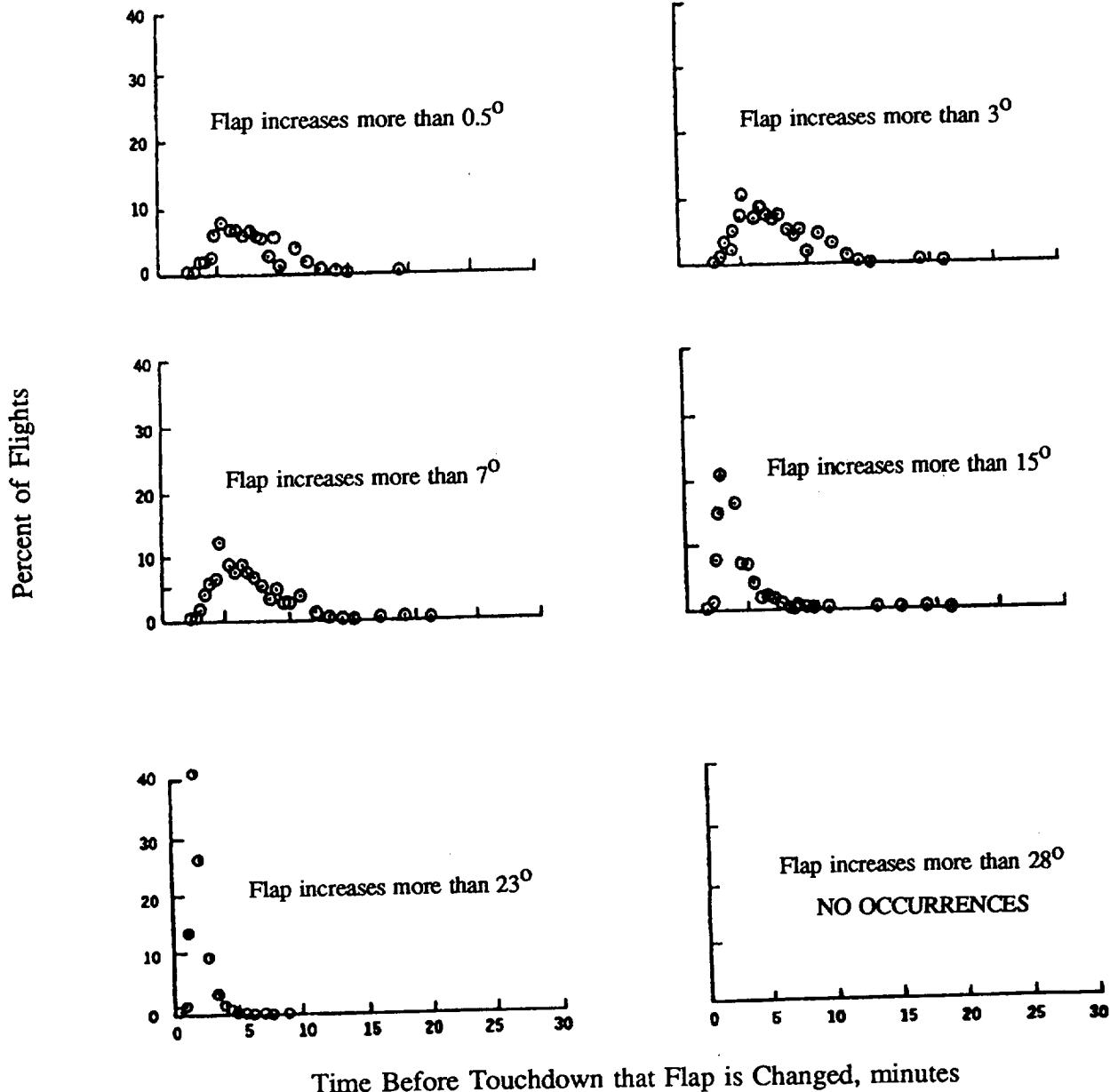
Figure 10.- Flap deflection times.

## FLAP DEFLECTION, DEGREES

TIME BEFORE TOUCHDOWN	MINUTES	0.5	3.0	7.0	15.0	23.0	28.0	NOTES
0.0 - 0.5	0	0	0	0	0	0	0	0
0.5 - 1.0	0	0	0	0	0	0	0	1.4
1.0 - 1.5	0	0	0	0	0	0.2	14.7	0
1.5 - 2.0	0	0	0	0.2	0.2	2.5	41.0	0
2.0 - 2.5	0.2	0.2	0.2	0.5	0.5	8.1	26.5	0
2.5 - 3.0	0.5	1.1	1.1	1.8	1.8	15.4	9.3	0
3.0 - 3.5	2.5	3.4	3.4	4.1	4.1	21.9	3.2	0
3.5 - 4.0	2.7	2.7	2.5	5.7	5.7	17.9	1.4	0
4.0 - 4.5	3.4	5.0	5.0	6.1	6.1	7.9	0.7	0
4.5 - 5.0	6.1	6.8	11.1	7.9	7.9	0.2	0	0
5.0 - 5.5	8.1	10.9	8.8	5.4	5.4	0.2	0	0
5.5 - 6.0	7.7	7.0	7.9	2.7	2.7	0.2	0	0
6.0 - 6.5	7.9	9.0	8.8	3.2	3.2	0	0	0
6.5 - 7.0	6.8	7.9	7.5	2.7	2.7	0.2	0	0
7.0 - 7.5	7.7	7.0	7.0	1.1	1.1	0	0	0
7.5 - 8.0	6.6	7.9	6.1	0.5	0.5	0	0	0
8.0 - 8.5	6.3	5.4	3.8	0.5	0.5	0	0	0
8.5 - 9.0	3.8	4.1	5.4	0.7	0.7	0.2	0	0
9.0 - 9.5	5.7	5.2	2.7	0.2	0.2	0	0	0
9.5 - 10.0	1.8	1.8	1.8	2.7	0.2	0	0	0
10.0 - 11.0	4.8	4.8	4.3	0.2	0.2	0	0	0
11.0 - 12.0	2.5	2.7	1.6	0	0	0	0	0
12.0 - 13.0	0.9	1.4	0.7	0	0	0	0	0
13.0 - 14.0	0.5	0.5	0.2	0	0	0	0	0
14.0 - 15.0	0.2	0.2	0.2	0.2	0.2	0	0	0
15.0 - 17.0	0	0	0.2	0.2	0.2	0	0	0
17.0 - 19.0	0.5	0.5	0.5	0	0	0	0	0
19.0 - 21.0	0	0.2	0.2	0	0	0	0	0
21.0 - 23.0	0	0	0	0	0	0	0	0
23.0 - 25.0	0	0	0	0	0	0	0	0
25.0 - 30.0	0	0	0	0	0	0	0	0
30.0 - 35.0	0.2	0	0	0	0	0	0	0
35.0 - 40.0	0	0	0	0	0	0	0	0
40.0 - 60.0	1.6	0	0	0	0	0	0	0
0.0 - 60.0	89.0	95.5	98.2	99.8	99.8	99.8	99.8	0

(b) Landing: Percent of flights vs times when landing flap deflection is increased to greater than indicated values

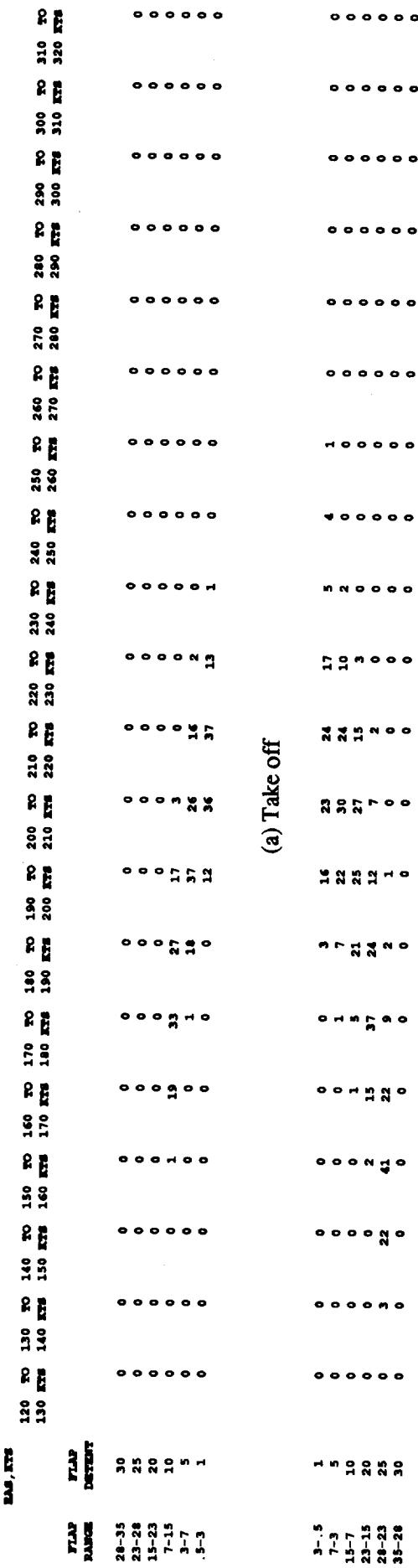
Figure 10.-Continued.



(c) Landing: Plots of data from Figure 10(b)

Figure 10.- Flap deflection times.

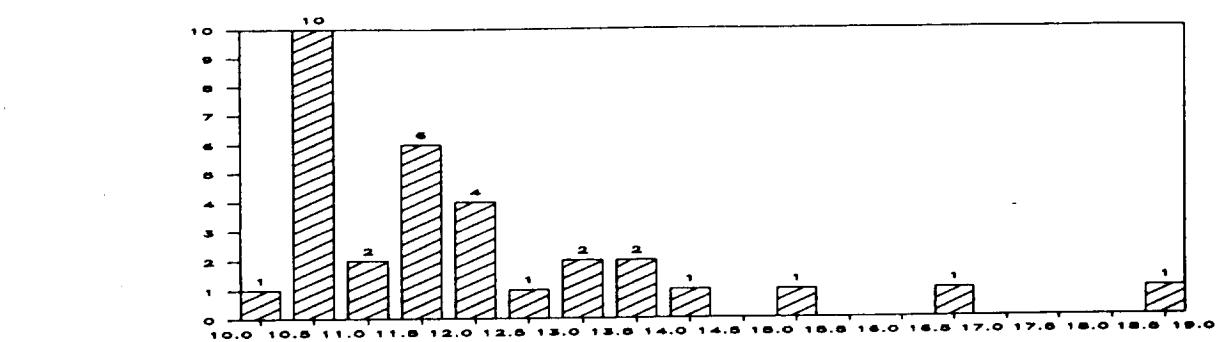
ORIGINAL PAGE IS  
OF POOR QUALITY



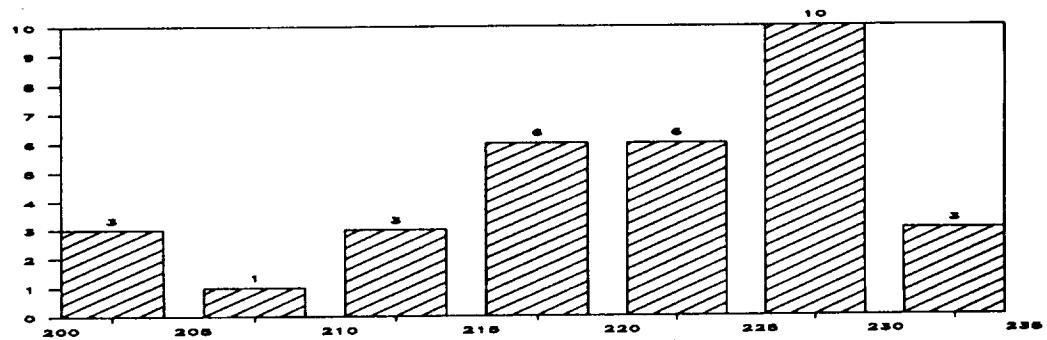
(a) Take off

(b) Landing

Figure 11.- Percent of flights vs equivalent airspeed at flap detent change.

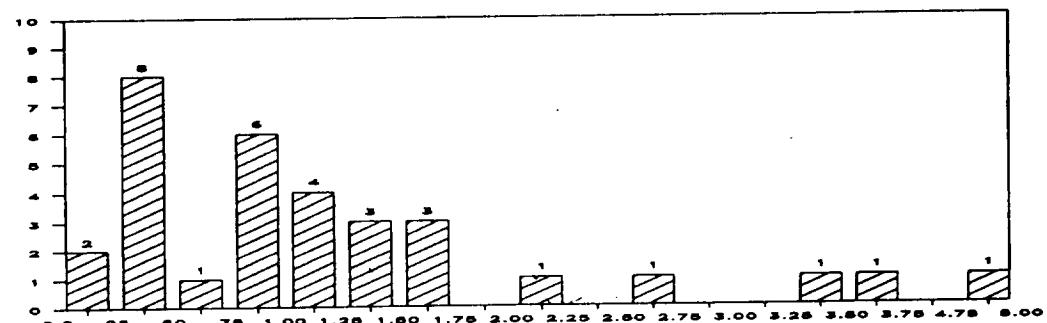


(a) Pressure altitude at initial flap deflection, kft.

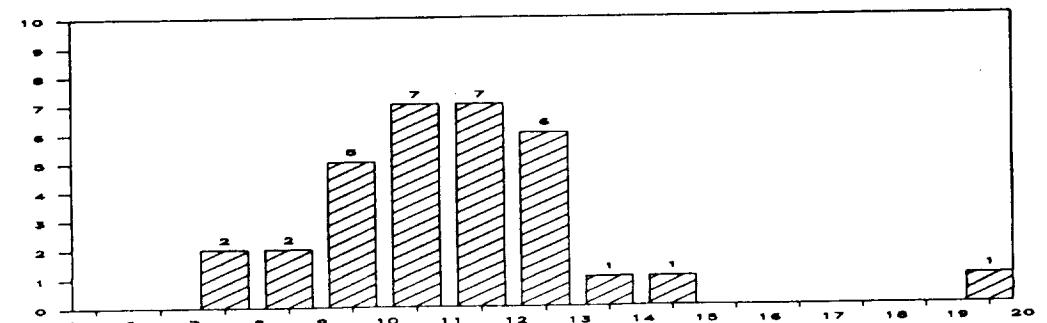


(b) Calibrated airspeed at initial flap deflection, kft.

Number of Flights



(c) Minutes above 10,000 ft. that flaps deflected > .5 degrees



(d) Minutes before touchdown of initial flap detection

Figure 12.- Flap use above 10,000 feet pressure altitude: 32 flights included.

LEVEL $a_n$ g's	PRESSURE ALTITUDE BANDS										TOTAL FLIGHTS 442	TOTAL FLIGHT HOURS FLAPS UP AND DOWN 1688.83	TOTAL FLIGHT MILES FLAPS UP AND DOWN 772612.93
	-500 TO 4500 FT	4500 TO 5500 FT	5500 TO 14500 FT	14500 TO 19500 FT	19500 TO 24500 FT	24500 TO 29500 FT	29500 TO 34500 FT	34500 TO 39500 FT	39500 TO 44500 FT	-500 TO 44500 FT			
1.60	0	0	0	0	0	0	0	0	0	0	0	0	0
1.40	0	0	0	0	0	0	0	0	0	0	0	0	0
1.20	0	0	0	0	0	0	0	0	0	0	0	0	0
1.00	0	0	0	0	0	0	0	0	0	0	0	0	0
.80	0	0	0	0	0	0	0	0	0	0	0	0	0
.70	0	0	0	0	0	0	0	0	0	0	0	0	0
.60	0	0	0	0	0	0	0	0	0	0	0	0	0
.50	0	0.02	0	0	0	0	0	0	0	0	0	0	0
.40	0.02	0.03	0.05	0.02	0	0.02	0	0	0	0	0.01	0.23	0.01
.30	0.43	0.54	0.15	0.09	0.02	0.01	0.01	0.01	0.01	0.01	0.03	2.27	0.08
.20	8.67	5.38	1.48	0.67	0.31	0.18	0.10	0.18	0.10	0.18	7.84	0.73	
.15	33.46	19.32	5.27	2.76	1.40	1.15	0.50	0.60	0.60	0.60	16.24	2.68	
.10	108.62	56.79	26.31	13.25	8.24	5.21	2.56	3.01	3.01	3.01	37.93	9.84	
.05	304.47	182.73	126.33	76.55	55.57	38.07	25.99	22.64	22.64	22.64	120.37	45.20	
0	669.40	636.77	653.44	785.69	885.27	983.03	1195.28	1202.38	1202.38	1202.38	1008.20	1114.77	
-.05	233.94	131.60	82.30	51.91	36.56	32.49	18.45	19.61	19.61	19.61	103.57	34.96	
-.10	60.86	27.06	12.94	7.36	4.68	3.52	2.13	2.46	2.46	2.46	32.36	5.97	
-.15	14.58	7.10	2.86	1.82	0.85	0.68	0.46	0.55	0.55	0.55	12.38	1.42	
-.20	3.35	2.31	0.67	0.60	0.14	0.08	0.11	0.17	0.17	0.17	6.13	0.39	
-.30	0.12	0.26	0.05	0	0	0	0.01	0.01	0.01	0.01	0.36	0.04	
-.40	0	0.02	0	0	0	0	0	0	0	0	0.57	0.01	
-.50	0	0.02	0	0	0	0	0	0	0	0	0.11	0	
-.60	0	0	0	0	0	0	0	0	0	0	0	0	
-.70	0	0	0	0	0	0	0	0	0	0	0	0	
-.80	0	0	0	0	0	0	0	0	0	0	0	0	
-.90	0	0	0	0	0	0	0	0	0	0	0	0	
-.100	0	0	0	0	0	0	0	0	0	0	0	0	
-.120	0	0	0	0	0	0	0	0	0	0	0	0	
-.140	0	0	0	0	0	0	0	0	0	0	0	0	
-.160	0	0	0	0	0	0	0	0	0	0	0	0	
FLIGHT HOURS @ ALT	57.68	57.61	54.89	43.48	48.52	79.06	273.34	1065.45	1065.45	1065.45	8.81	1688.83	
FLIGHT MILES @ ALT	10712.91	14655.73	18759.60	17393.17	21054.53	36267.12	133304.10	516183.63	516183.63	516183.63	4282.14	772612.93	

(a)  $a_n$  Level crossing counts per hour within pressure altitude bands

Figure 13.- Normal acceleration exceedances.

LEVEL q' s	PRESSURE ALTITUDE BANDS										TOTAL FLIGHTS 442	TOTAL FLIGHT HOURS FLAPS UP AND DOWN 1688.93	TOTAL FLIGHT MILES FLAPS UP AND DOWN 772612.93
	-500 TO 4500 FT	4500 TO 9500 FT	9500 TO 14500 FT	14500 TO 19500 FT	19500 TO 24500 FT	24500 TO 29500 FT	29500 TO 34500 FT	34500 TO 39500 FT	39500 TO 44500 FT				
.00	0	0	0	0	0	0	0	0	0	0	0	0	0
.10	0	0	0	0	0	0	0	0	0	0	0	0	0
.20	0	0	0	0	0	0	0	0	0	0	0	0	0
.30	0	0	0	0	0	0	0	0	0	0	0	0	0
.40	0	0	0	0	0	0	0	0	0	0	0	0	0
.50	0	0	0	0	0	0	0	0	0	0	0	0	0
.60	0	0	0	0	0	0	0	0	0	0	0	0	0
.70	0	0	0	0	0	0	0	0	0	0	0	0	0
.80	0	0	0	0	0	0	0	0	0	0	0	0	0
.90	0	0	0	0	0	0	0	0	0	0	0	0	0
.00	0	0	0	0	0	0	0	0	0	0	0	0	0
.10	0	0	0	0	0	0	0	0	0	0	0	0	0
.20	0	0	0	0	0	0	0	0	0	0	0	0	0
.30	0	0	0	0	0	0	0	0	0	0	0	0	0
.40	0	0	0	0	0	0	0	0	0	0	0	0	0
.50	0	0	0	0	0	0	0	0	0	0	0	0	0
.60	0	0	0	0	0	0	0	0	0	0	0	0	0
.70	0	0	0	0	0	0	0	0	0	0	0	0	0
.80	0	0	0	0	0	0	0	0	0	0	0	0	0
.90	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0
.10	0	0	0	0	0	0	0	0	0	0	0	0	0
.20	0	0	0	0	0	0	0	0	0	0	0	0	0
.30	0	0	0	0	0	0	0	0	0	0	0	0	0
.40	0	0	0	0	0	0	0	0	0	0	0	0	0
.50	0	0	0	0	0	0	0	0	0	0	0	0	0
.60	0	0	0	0	0	0	0	0	0	0	0	0	0
.70	0	0	0	0	0	0	0	0	0	0	0	0	0
.80	0	0	0	0	0	0	0	0	0	0	0	0	0
.90	0	0	0	0	0	0	0	0	0	0	0	0	0
-1.00	0	0	0	0	0	0	0	0	0	0	0	0	0
-1.20	0	0	0	0	0	0	0	0	0	0	0	0	0
-1.40	0	0	0	0	0	0	0	0	0	0	0	0	0
-1.60	0	0	0	0	0	0	0	0	0	0	0	0	0
FLIGHT HOURS @ ALT	57.68	57.61	54.89	43.48	48.52	79.06	273.34	1065.45	8.81	1688.93			
FLIGHT MILES @ ALT	10712.91	14655.73	18759.60	17393.17	21054.53	36267.12	133304.10	516183.63	4282.14	772612.93			

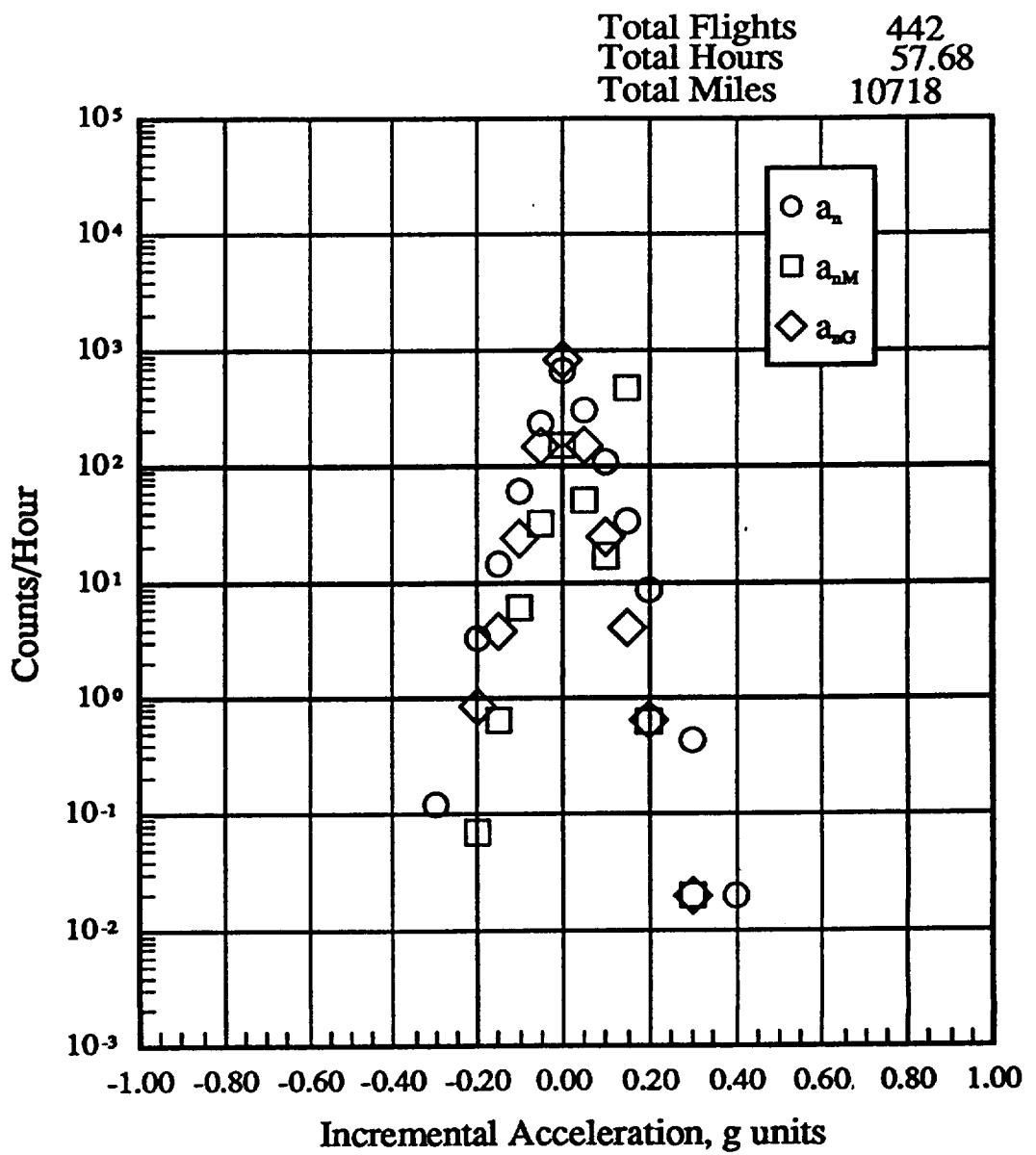
(b)  $a_{nM}$  Level crossing counts per hour within pressure altitude bands

Figure 13.- Continued.

		PRESSURE ALTITUDE BANDS																			
		-500 TO 4500 FT		4500 TO 9500 FT		9500 TO 14500 FT		14500 TO 19500 FT		1950 TO 24500 FT		24500 TO 29500 FT		29500 TO 34500 FT		34500 TO 39500 FT		39500 TO 44500 FT		-500 TO 44500 FT	
$a_{nG}$	LEVEL g's																				
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.15	4.11	2.79	0.97	0.60	0.25	0.14	0.11	0.14	0.11	0.14	0.11	0.14	0.11	0.14	0.11	0.14	0.11	0.14	0.11	0.14	0.11
.10	24.52	10.85	4.23	2.58	1.38	0.94	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48
.05	150.37	63.79	26.51	17.62	11.95	8.90	4.89	4.89	4.89	4.89	4.89	4.89	4.89	4.89	4.89	4.89	4.89	4.89	4.89	4.89	4.89
0	832.76	849.54	873.74	962.55	1025.26	1085.15	1143.63	1143.63	1143.63	1143.63	1143.63	1143.63	1143.63	1143.63	1143.63	1143.63	1143.63	1143.63	1143.63	1143.63	1143.63
-0.05	147.62	63.44	26.25	17.48	12.45	8.17	4.99	4.99	4.99	4.99	4.99	4.99	4.99	4.99	4.99	4.99	4.99	4.99	4.99	4.99	4.99
-0.10	23.94	11.75	4.12	2.83	1.48	0.68	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59
-0.15	3.85	2.85	0.97	0.60	0.25	0.11	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12
-0.20	0.85	0.92	0.22	0.14	0	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
-0.30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-0.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-0.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-0.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-0.70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-0.80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-0.90	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-1.20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-1.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-1.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FLIGHT HOURS @ ALT	57.68	57.61	54.89	43.48	48.52	79.06	273.34	1065.45	1065.45	1065.45	1065.45	1065.45	1065.45	1065.45	1065.45	1065.45	1065.45	1065.45	1065.45	1065.45	
FLIGHT MILES @ ALT	10712.91	14655.73	18759.60	17393.17	21054.53	35267.12	133304.10	516193.63	516193.63	516193.63	516193.63	516193.63	516193.63	516193.63	516193.63	516193.63	516193.63	516193.63	516193.63	516193.63	
TOTAL FLIGHTS																					
TOTAL FLIGHT HOURS	442																				
TOTAL FLIGHT MILES	1688.83																				
TOTAL FLIGHT MILLES	772612.93																				

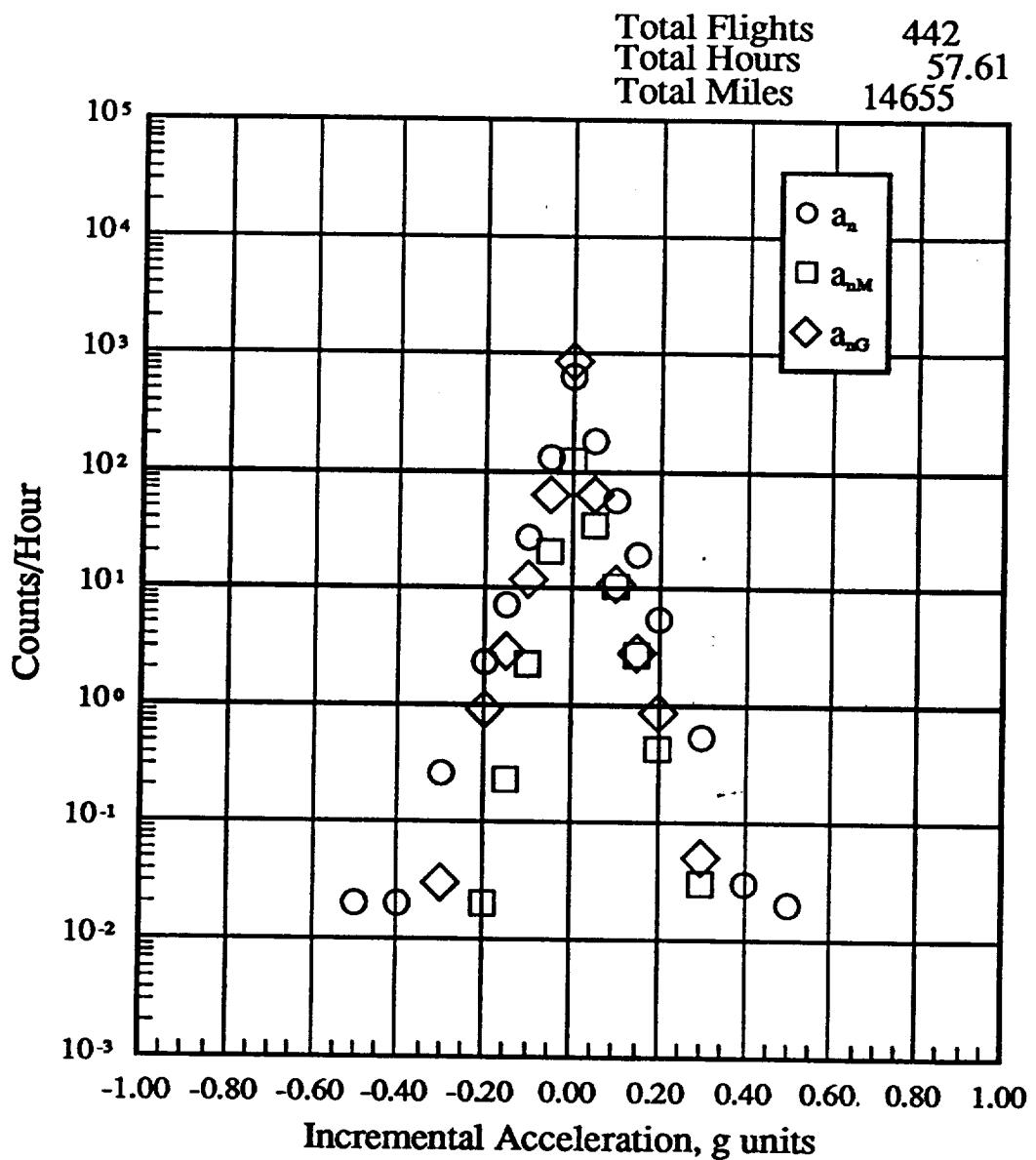
(c)  $a_{nG}$  Level crossing counts per hour within pressure altitude bands

Figure 13.- Continued.



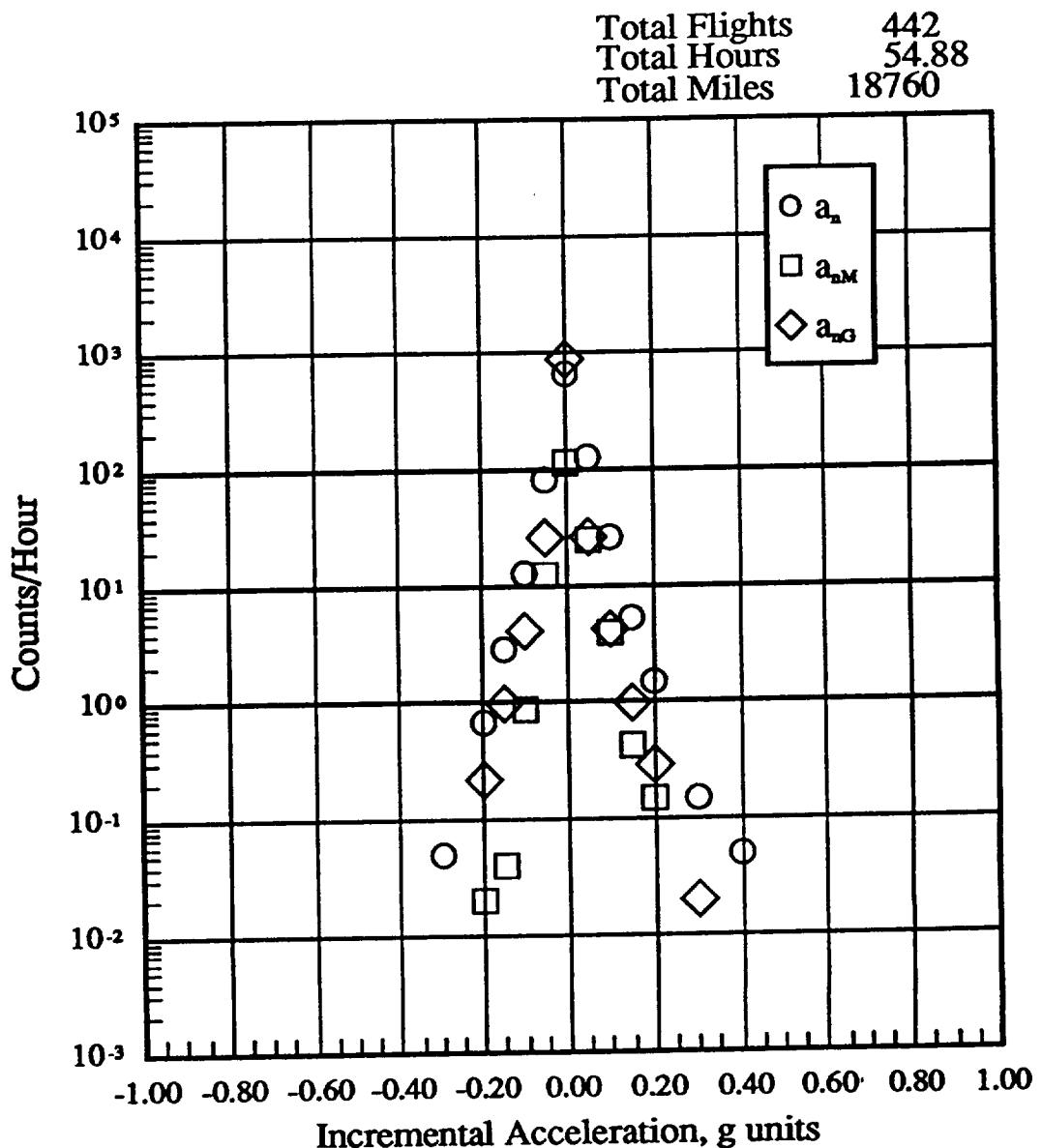
(d)  $a_n$ ,  $a_M$ ,  $a_G$ , -500 to 4500 feet altitude

Figure 13.- Continued.



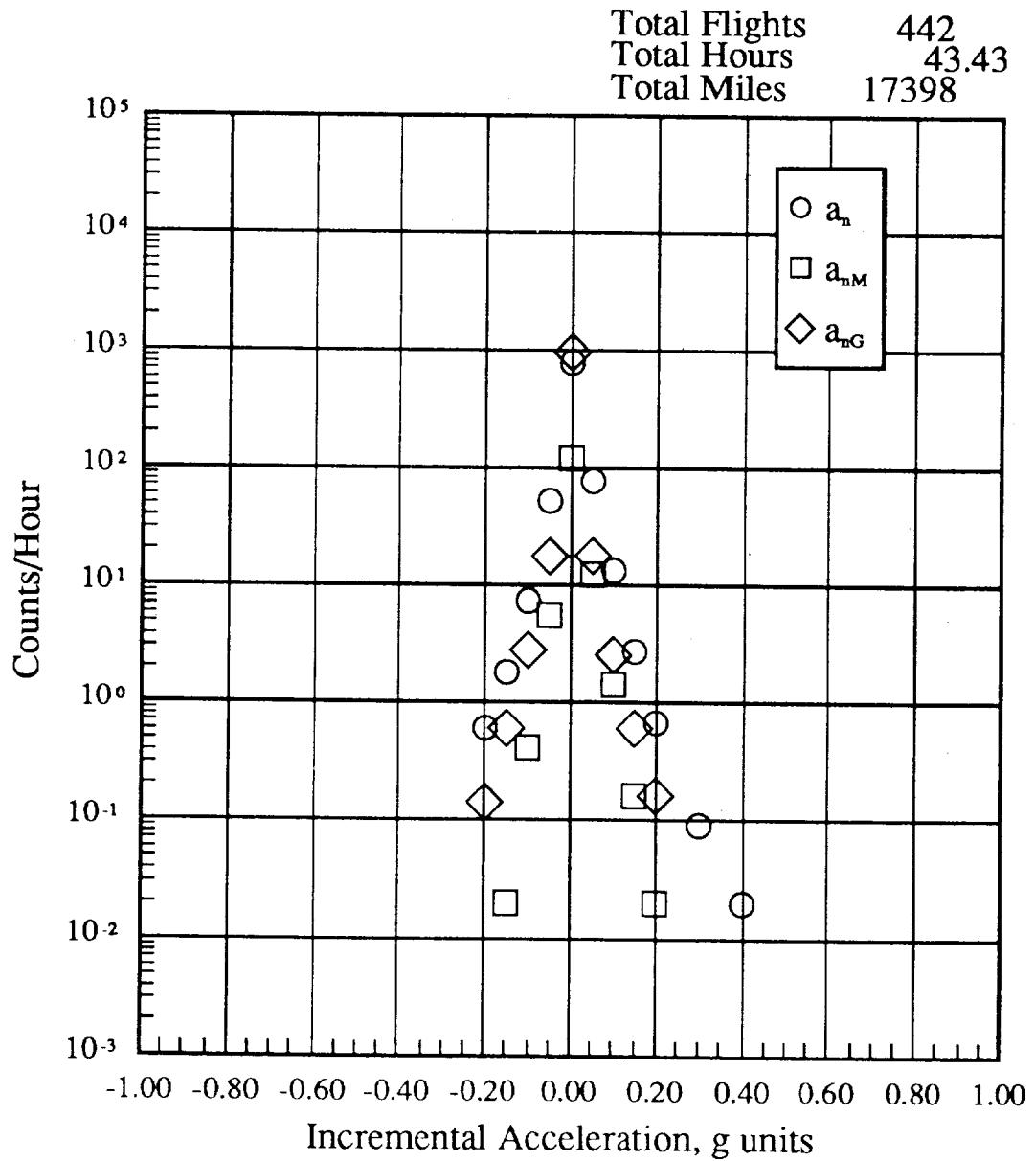
(e)  $a_n$ ,  $a_{nM}$ ,  $a_{nG}$ , 4500 to 9500 feet altitude

Figure 13.- Continued.



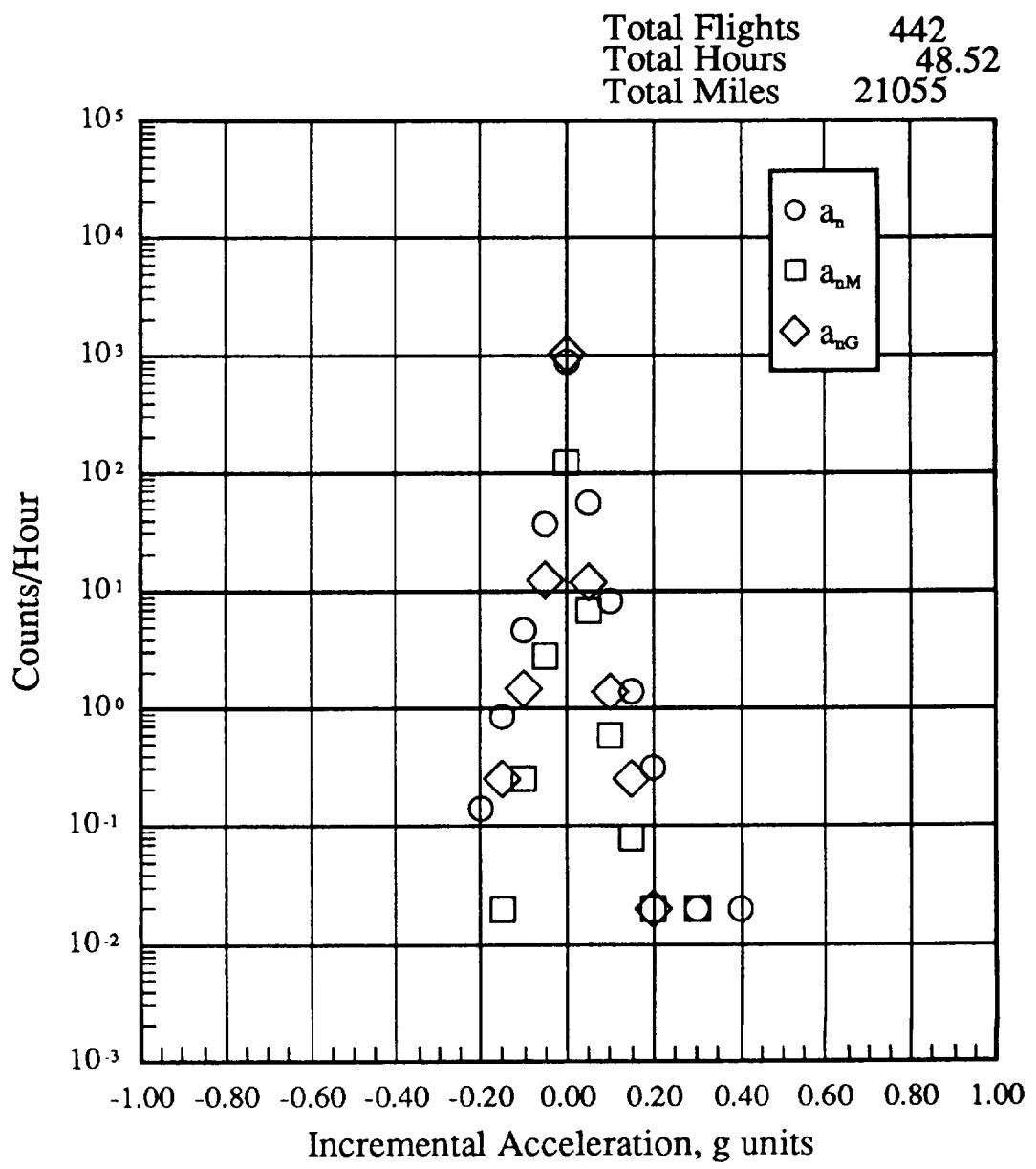
(f)  $a_n$ ,  $a_{nM}$ ,  $a_{nG}$ , 9500 to 14500 feet altitude

Figure 13.- Continued.



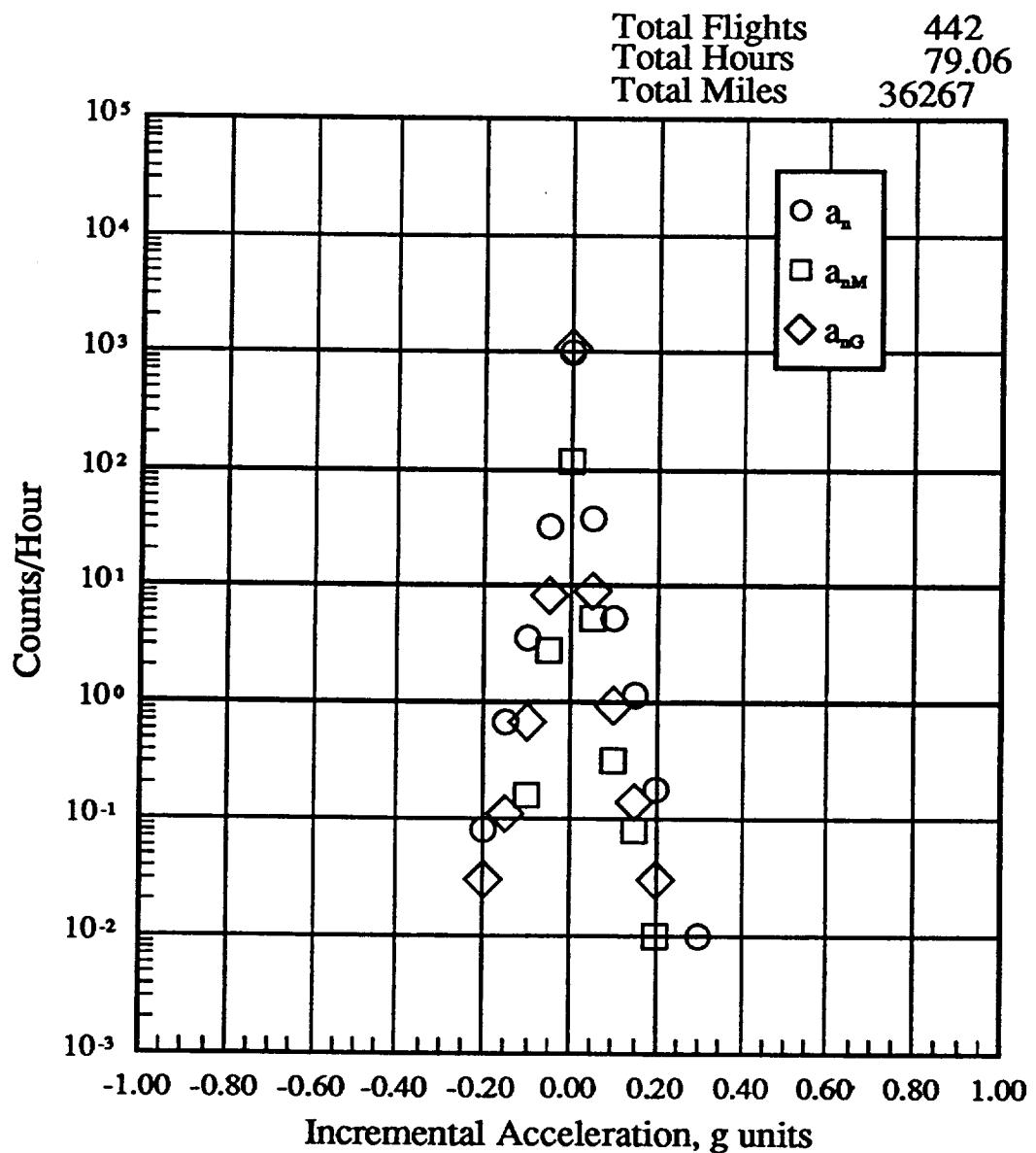
(g)  $a_n$ ,  $a_{nM}$ ,  $a_{nG}$ , 14500 to 19500 feet altitude

Figure 13.- Continued.



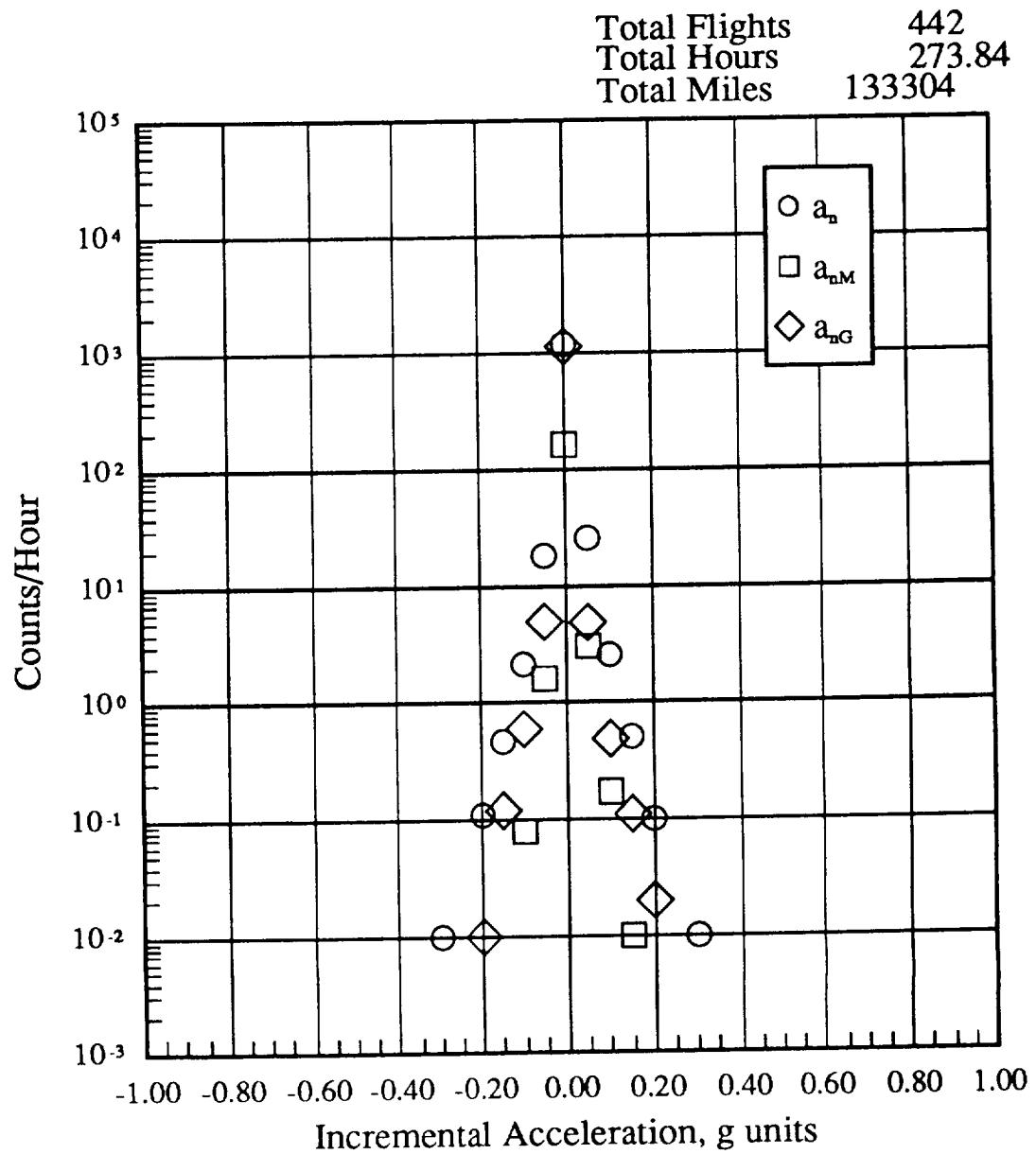
(h)  $a_n$ ,  $a_{nM}$ ,  $a_{nG}$ , 19500 to 24500 feet altitude

Figure 13.- Continued.



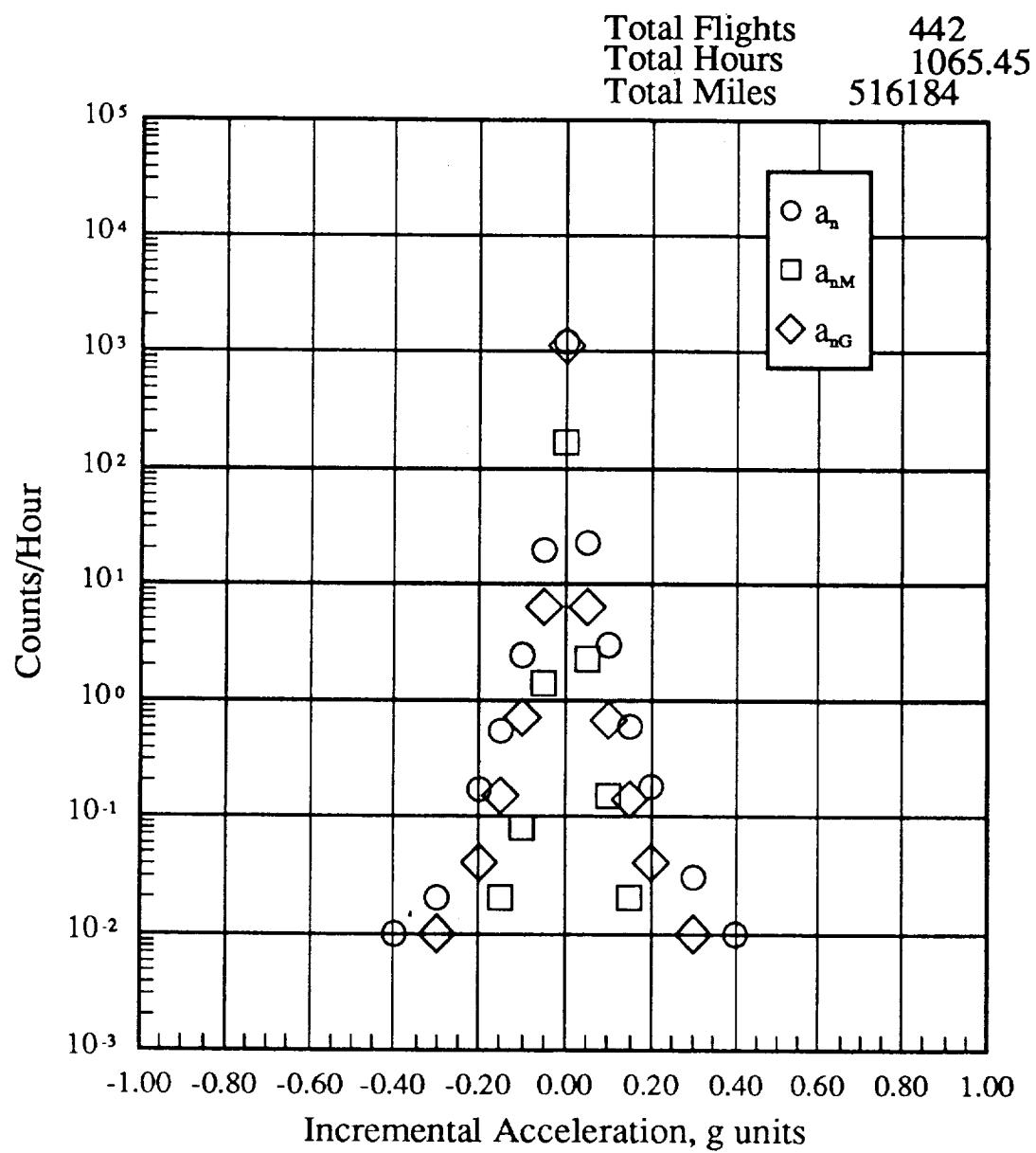
(i)  $a_n$ ,  $a_{nM}$ ,  $a_{nG}$ , 24500 to 29500 feet altitude

Figure 13.- Continued.



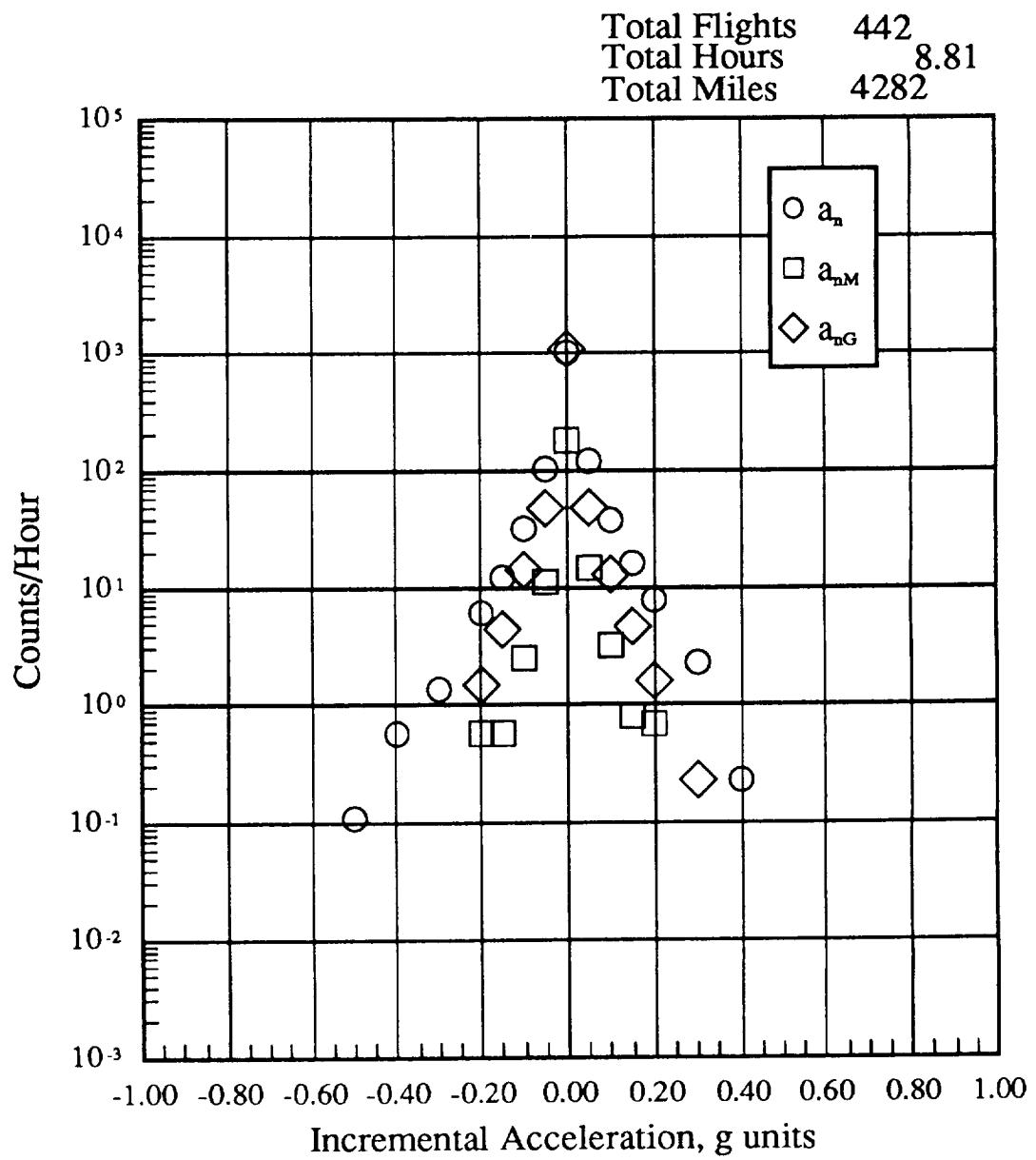
(j)  $a_n$ ,  $a_{nM}$ ,  $a_{nG}$ , 29500 to 34500 feet altitude

Figure 13.- Continued.



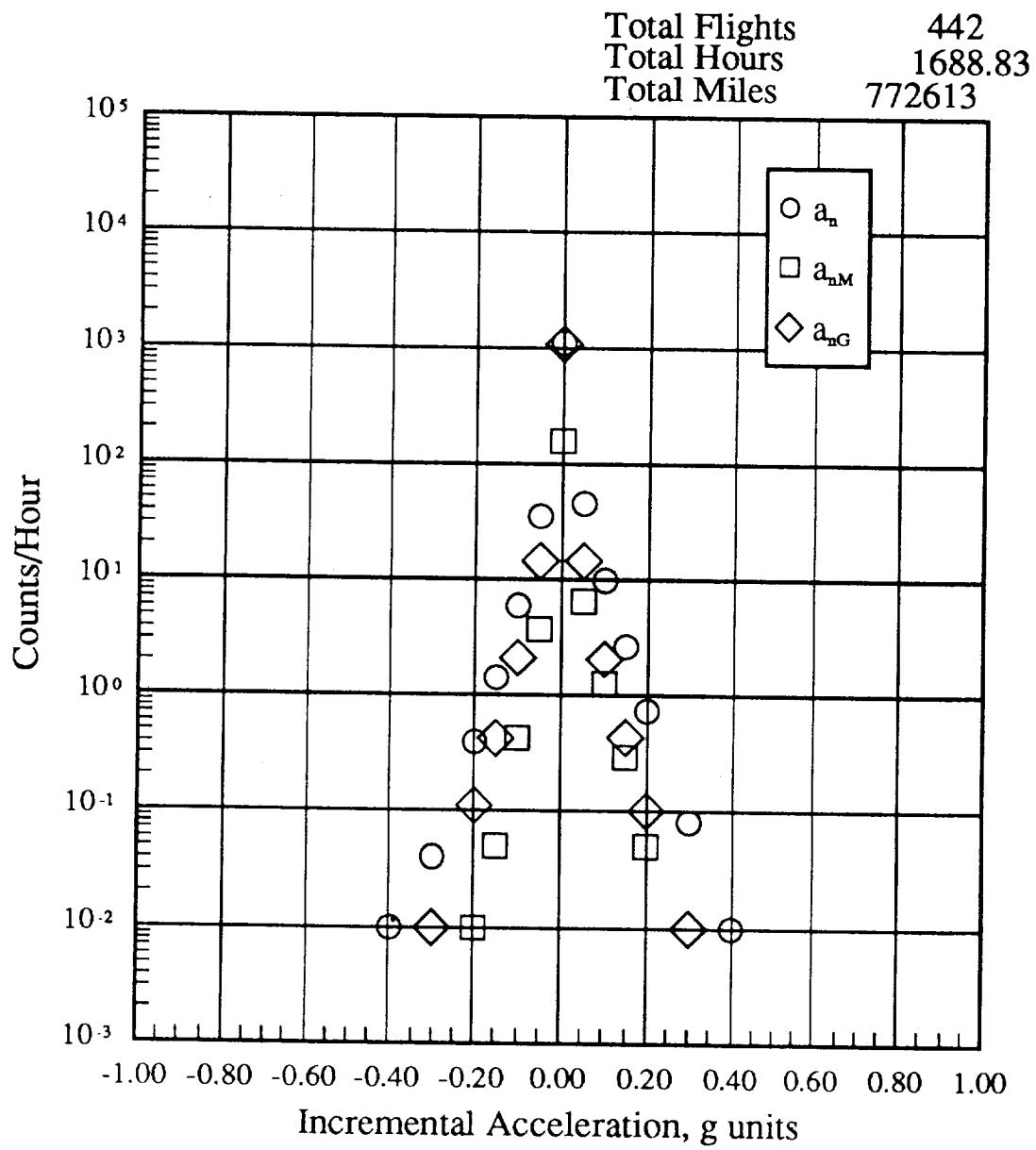
(k)  $a_n$ ,  $a_{nM}$ ,  $a_{nG}$ , 34500 to 39500 feet altitude

Figure 13.- Continued.



(I)  $a_n$ ,  $a_{nM}$ ,  $a_{nG}$ , 39500 to 44500 feet altitude

Figure 13.- Continued.



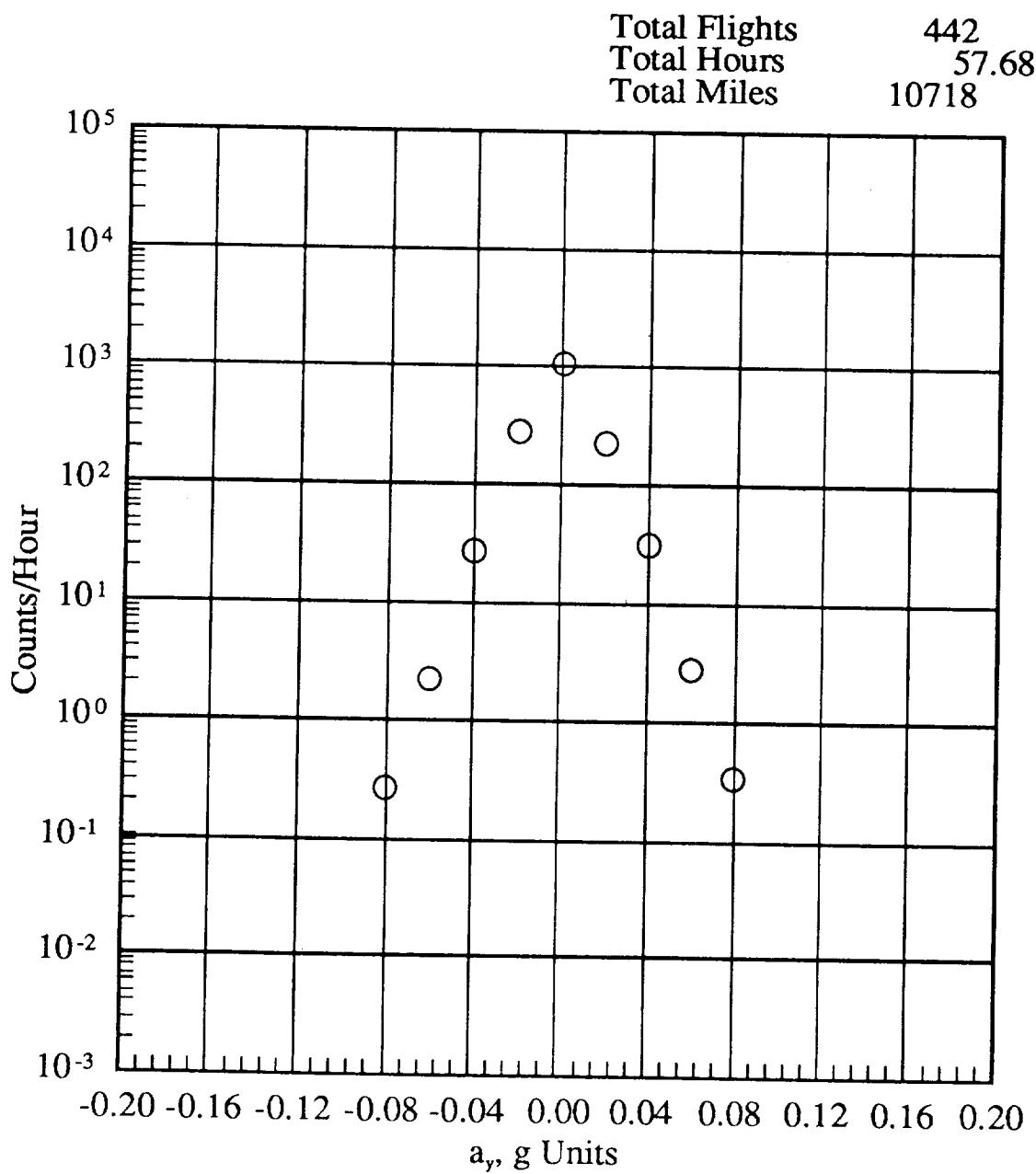
(m)  $a_n$ ,  $a_{nM}$ ,  $a_{nG}$ , -500 to 44500 feet altitude

Figure 13.- Concluded.

LEVEL g/s	PRESSURE ALTITUDE BANDS										TOTAL FLIGHTS 442	TOTAL FLIGHT HOURS FLAPS UP AND DOWN 1688.83	TOTAL FLIGHT MILES FLAPS UP AND DOWN 772612.93
	-500 TO 4500 FT	4500 TO 9500 FT	9500 TO 14500 FT	14500 TO 19500 FT	19500 TO 24500 FT	24500 TO 29500 FT	29500 TO 34500 FT	34500 TO 39500 FT	39500 TO 44500 FT				
.48	0	0	0	0	0	0	0	0	0	0	0	0	0
.44	0	0	0	0	0	0	0	0	0	0	0	0	0
.40	0	0	0	0	0	0	0	0	0	0	0	0	0
.36	0	0	0	0	0	0	0	0	0	0	0	0	0
.32	0	0	0	0	0	0	0	0	0	0	0	0	0
.28	0	0	0	0	0	0	0	0	0	0	0	0	0
.24	0	0	0	0	0	0	0	0	0	0	0	0	0
.20	0	0	0	0	0	0	0	0	0	0	0	0	0
.16	0	0	0	0	0	0	0	0	0	0	0	0	0
.12	0	0	0	0	0	0.02	0	0	0	0	0	0	0
.08	0.33	0.09	0.09	0.12	0.02	0.03	0.03	0.03	0.04	1.25	0.06	0.06	0.06
.06	2.76	0.94	0.66	0.46	0.41	0.23	0.16	0.20	0.20	4.77	0.36	0.36	0.36
.04	31.59	8.99	2.92	2.23	2.12	1.78	1.03	1.35	1.9	65	2.80	2.80	2.80
.02	229.12	81.68	29.02	16.70	20.08	15.96	9.67	13.75	79	72	24.03	24.03	24.03
0	1077.16	850.24	593.08	569.08	647.19	1022.62	1394.45	1387.04	1368	87	1274.08	1274.08	1274.08
-0.02	283.44	165.51	123.22	86.83	62.45	37.35	13.86	16.83	102	89	38.51	38.51	38.51
-0.04	27.43	16.88	9.47	6.79	2.68	2.33	0.90	1.40	18	17	3.30	3.30	3.30
-0.06	2.20	2.22	1.55	1.10	0.29	0.27	0.08	0.26	4	66	0.45	0.45	0.45
-0.08	0.26	0.28	0.18	0.48	0.04	0.06	0.02	0.06	0.06	1.36	0.09	0.09	0.09
-0.10	0	0.02	0	0	0.07	0	0	0	0	0.11	0	0	0
-0.12	0	0	0	0	0	0	0	0	0	0	0	0	0
-0.14	0	0	0	0	0	0	0	0	0	0	0	0	0
-0.16	0	0	0	0	0	0	0	0	0	0	0	0	0
-0.20	0	0	0	0	0	0	0	0	0	0	0	0	0
-0.24	0	0	0	0	0	0	0	0	0	0	0	0	0
-0.28	0	0	0	0	0	0	0	0	0	0	0	0	0
-0.32	0	0	0	0	0	0	0	0	0	0	0	0	0
-0.36	0	0	0	0	0	0	0	0	0	0	0	0	0
-0.40	0	0	0	0	0	0	0	0	0	0	0	0	0
-0.44	0	0	0	0	0	0	0	0	0	0	0	0	0
-0.48	0	0	0	0	0	0	0	0	0	0	0	0	0
FLIGHT HOURS @ ALT	57.68	57.61	54.89	43.48	48.52	79.06	273.34	1065.45	8.81	1688.83			
FLIGHT MILES @ ALT	10712.91	14655.73	18759.60	17393.17	21054.53	36267.12	133304.10	516183.63	4282.14	772612.93	442		

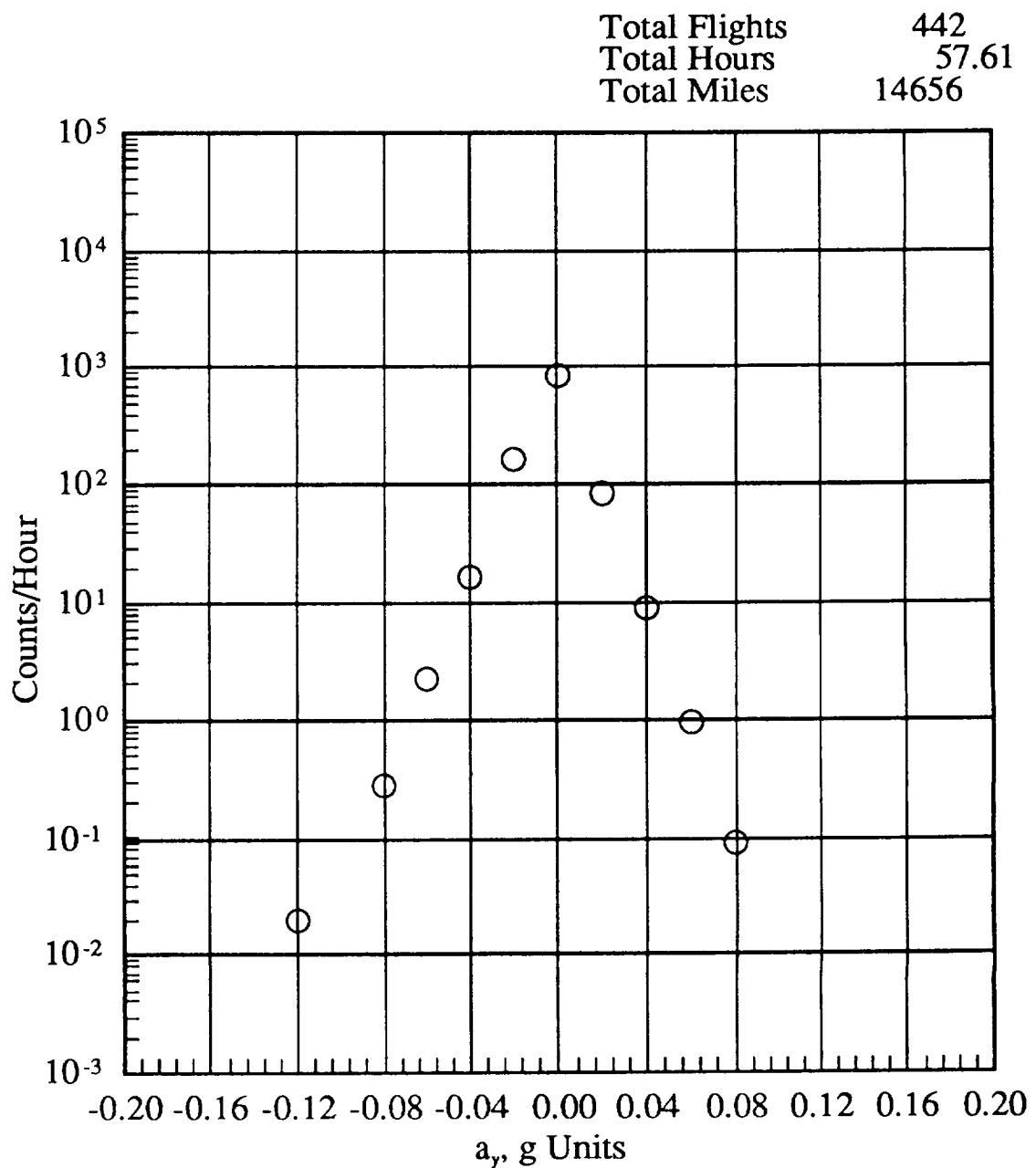
(a) a Level crossing counts per hour within pressure altitude bands

Figure 14.- Lateral acceleration exceedances.



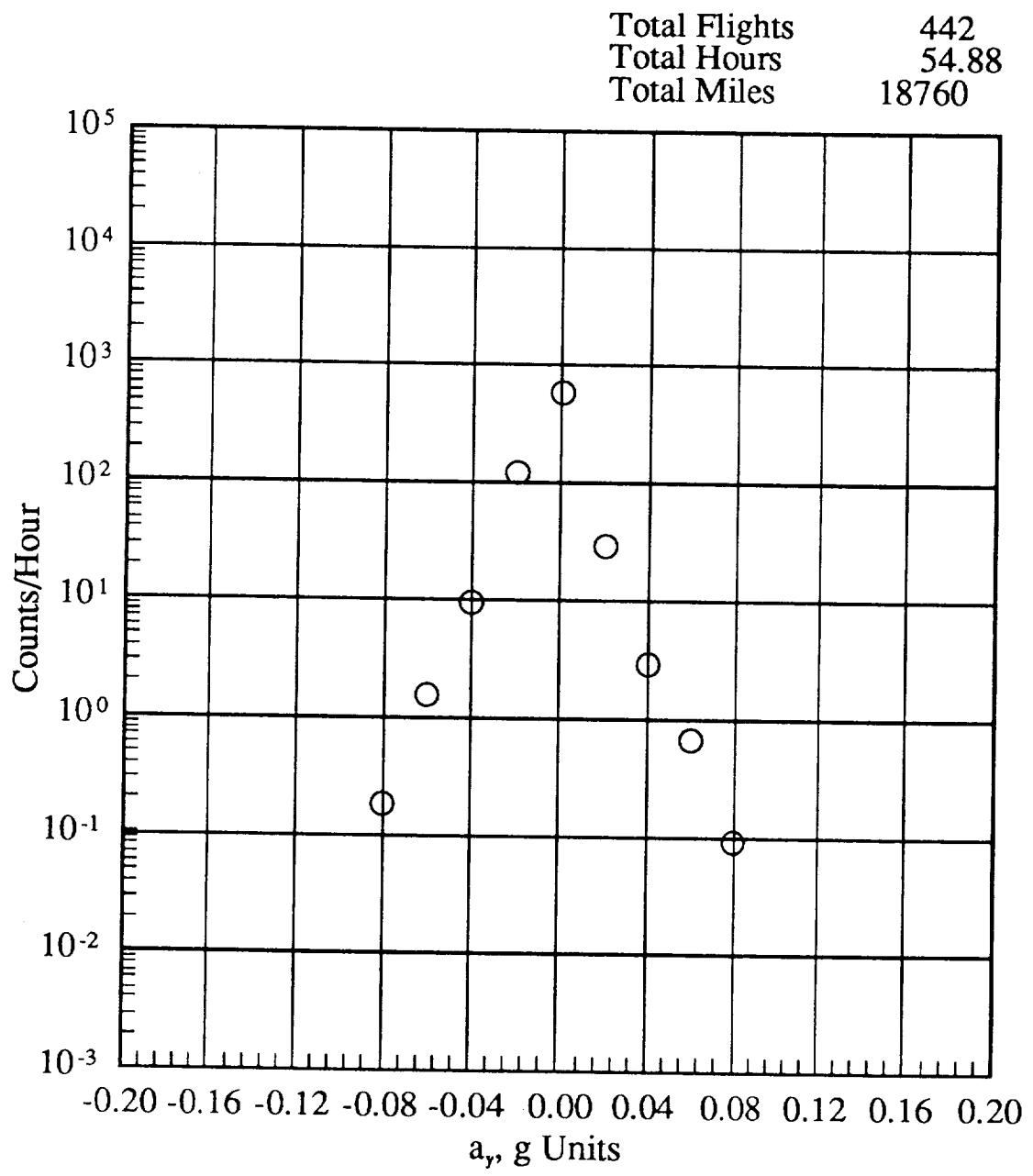
(b) -500 to 4500 feet altitude

Figure 14.- Continued.



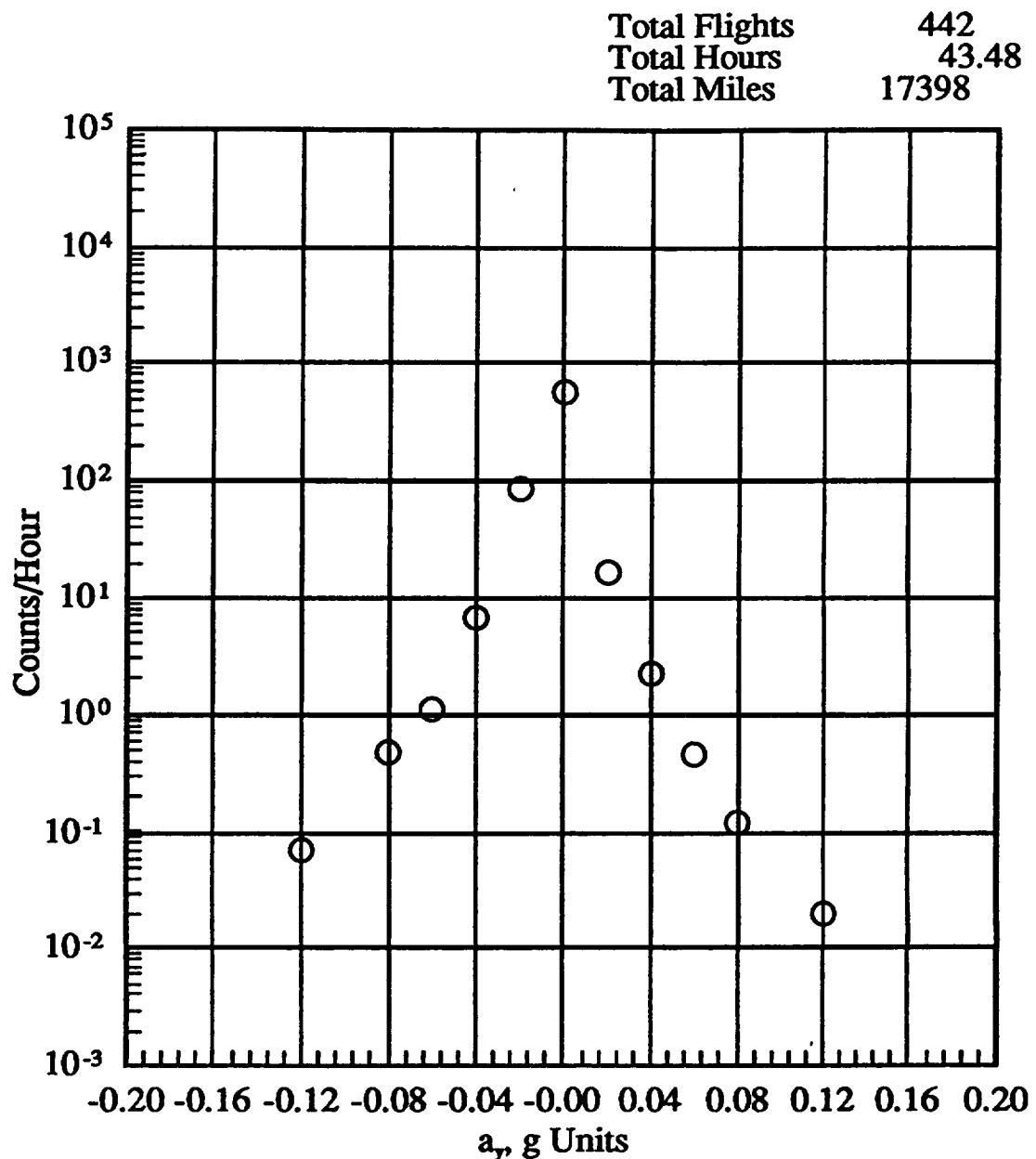
(c) 4500 to 9500 feet altitude

Figure 14.- Continued.



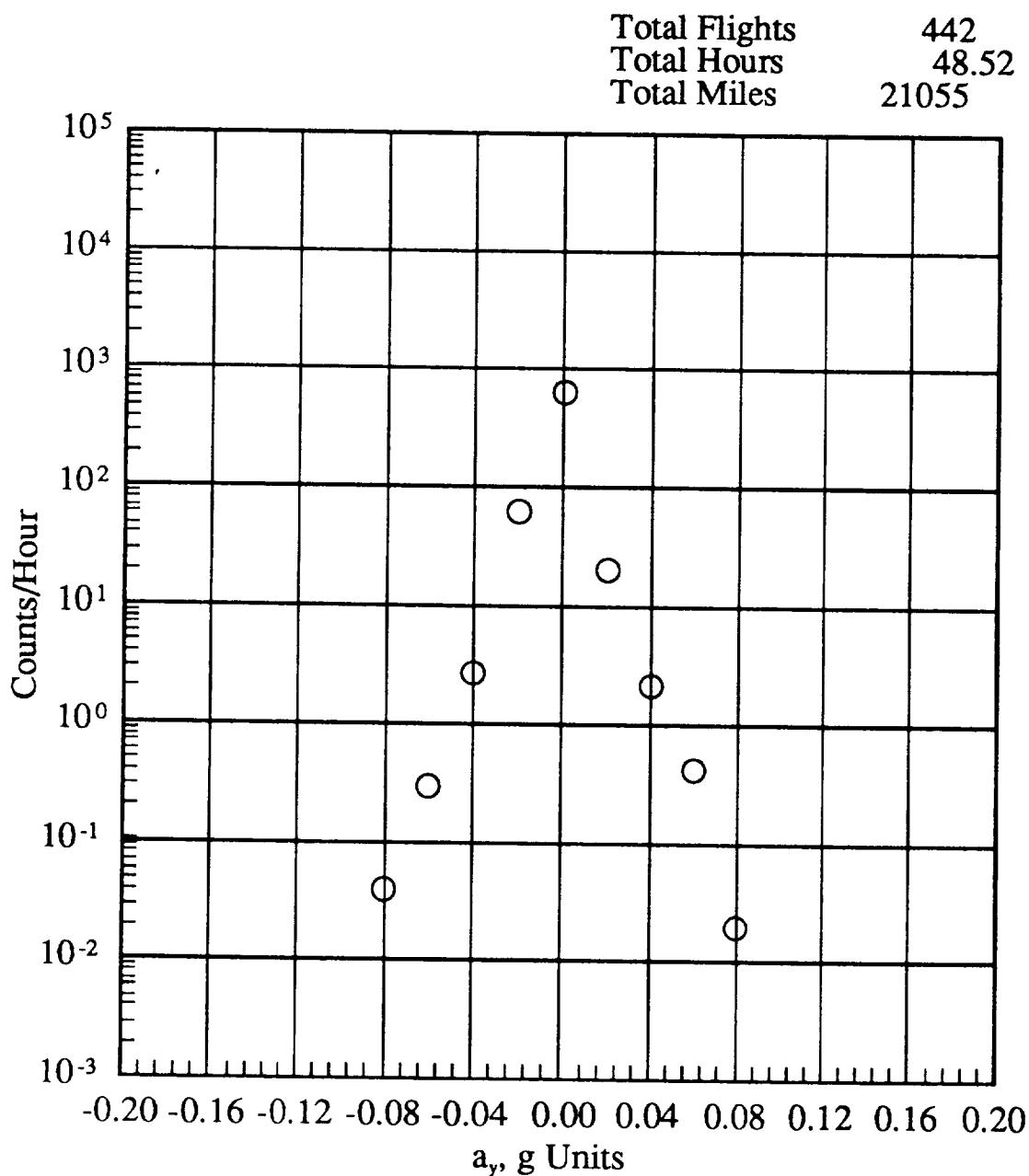
(d) 9500 to 14500 feet altitude

Figure 14.- Continued.



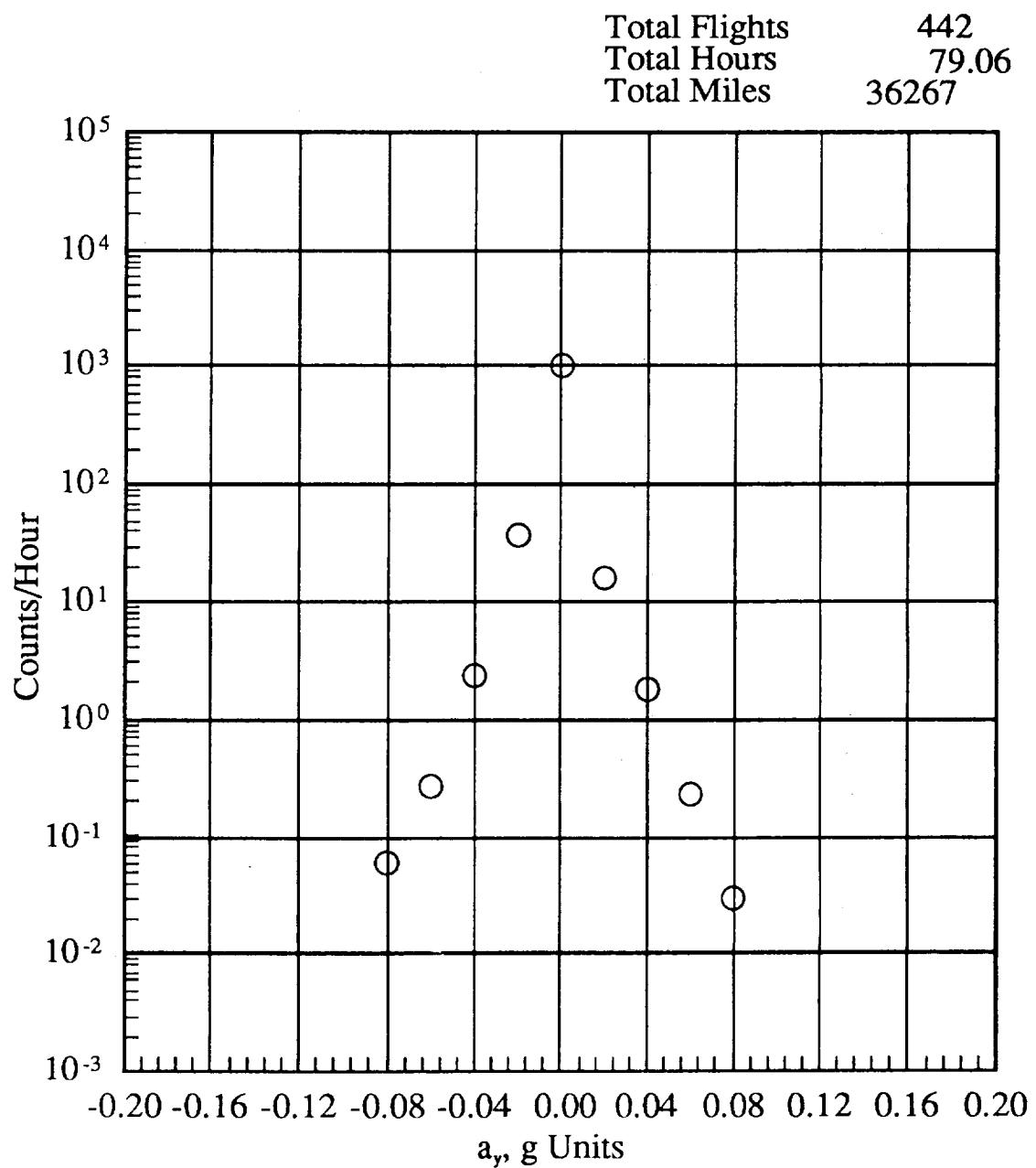
(e) 14500 to 19500 feet altitude

Figure 14.- Continued.



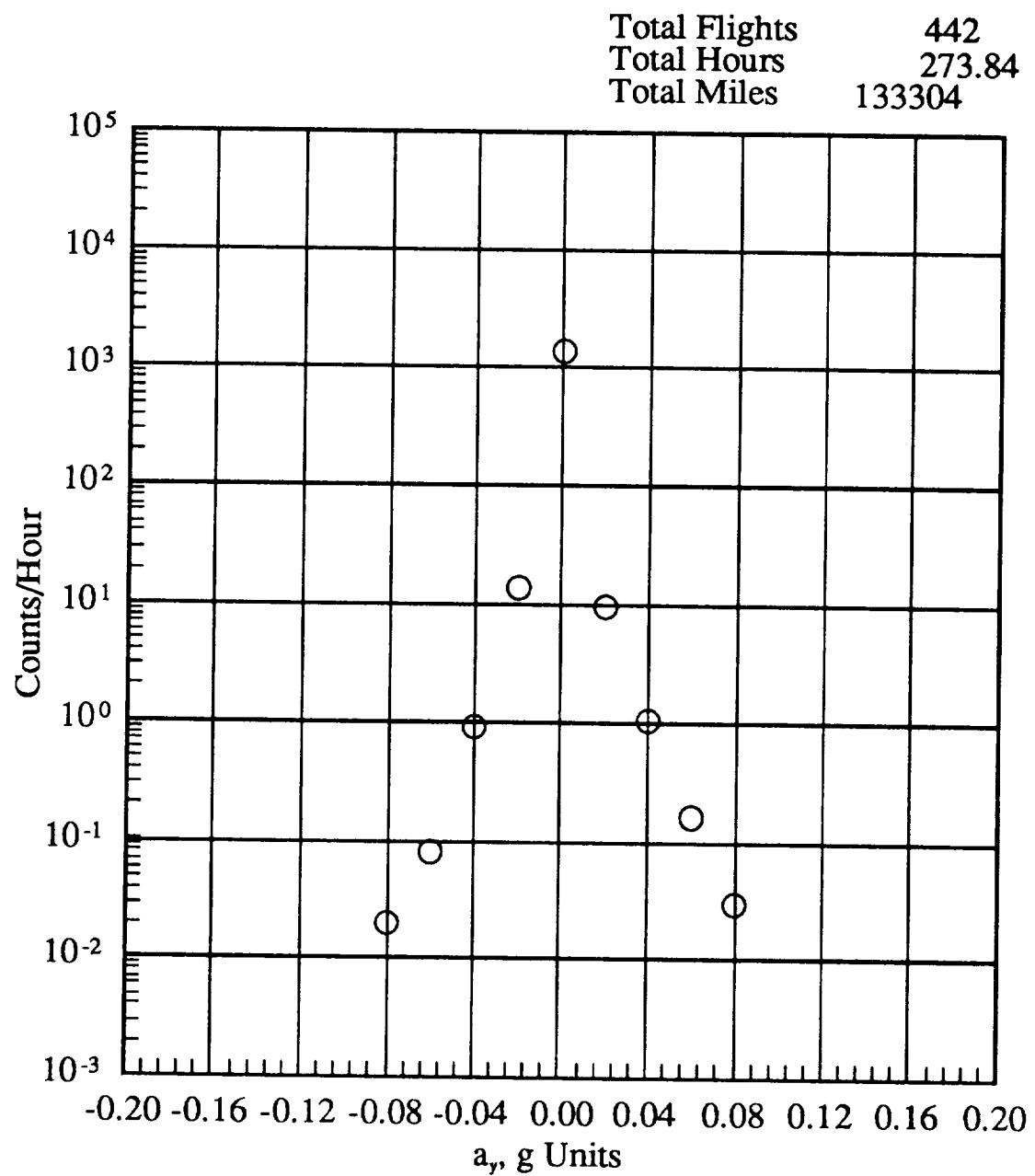
(f) 19500 to 24500 feet altitude

Figure 14.- Continued.



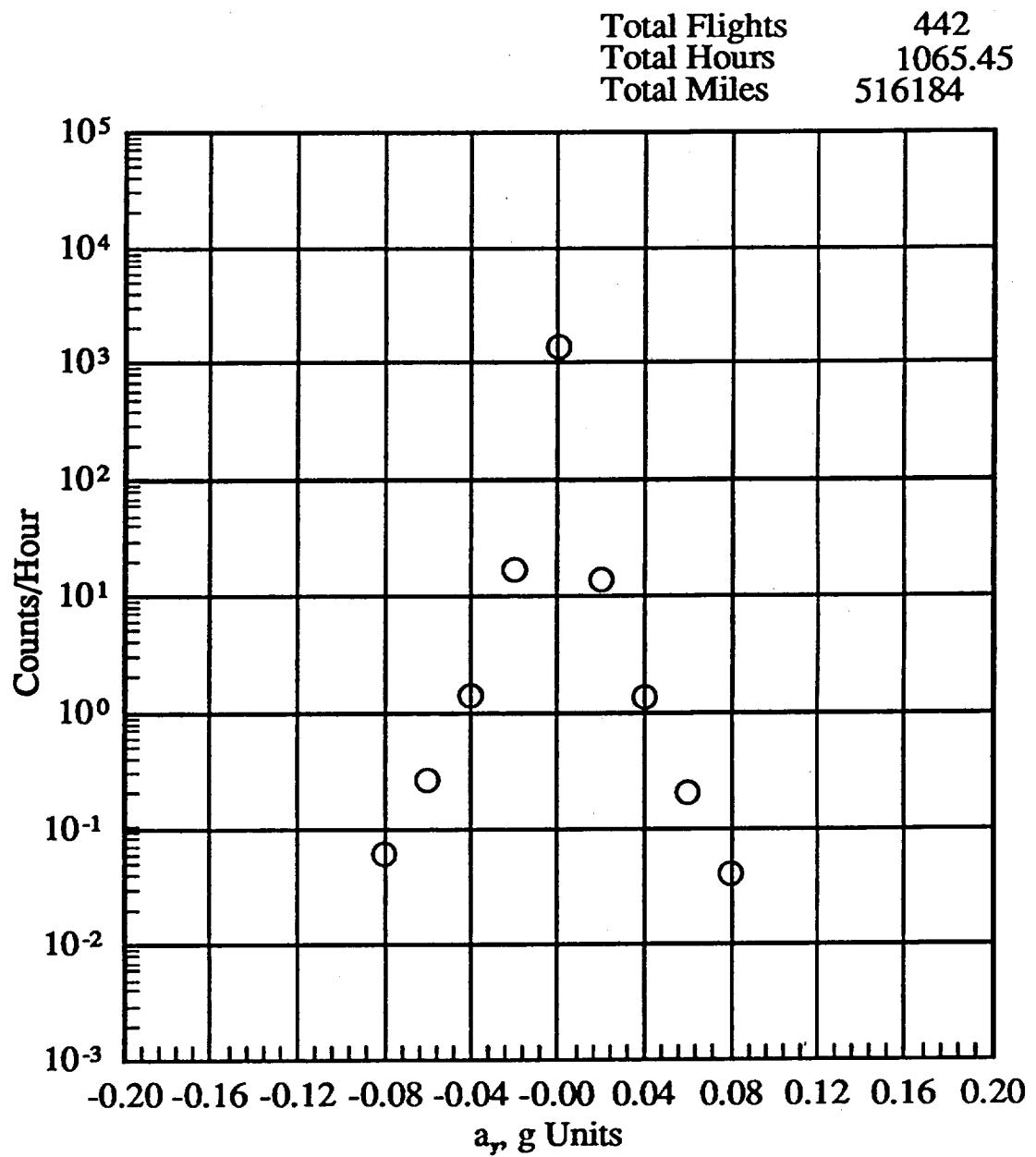
(g) 24500 to 29500 feet altitude

Figure 14.- Continued.



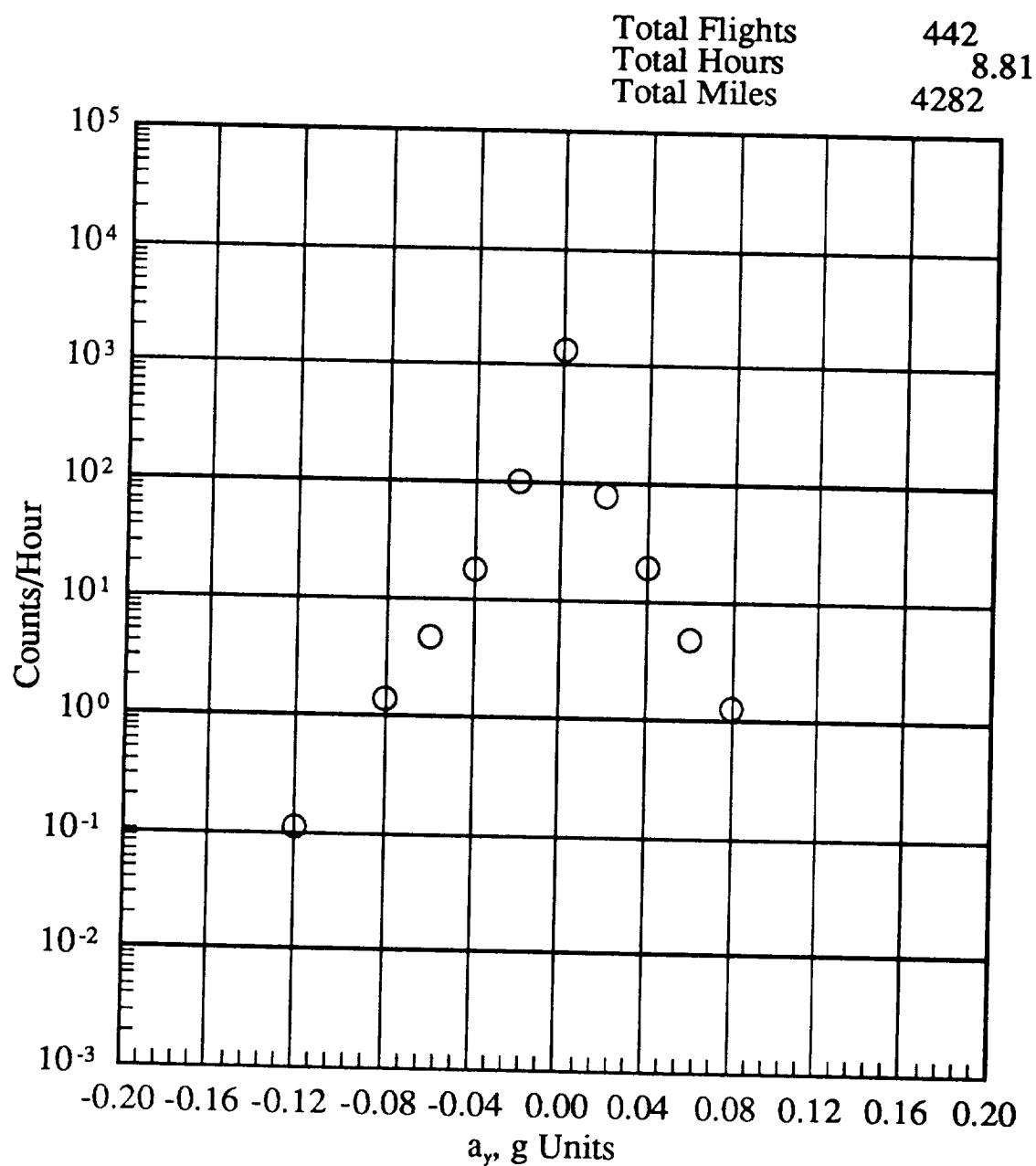
(h) 29500 to 34500 feet altitude

Figure 14.- Continued.



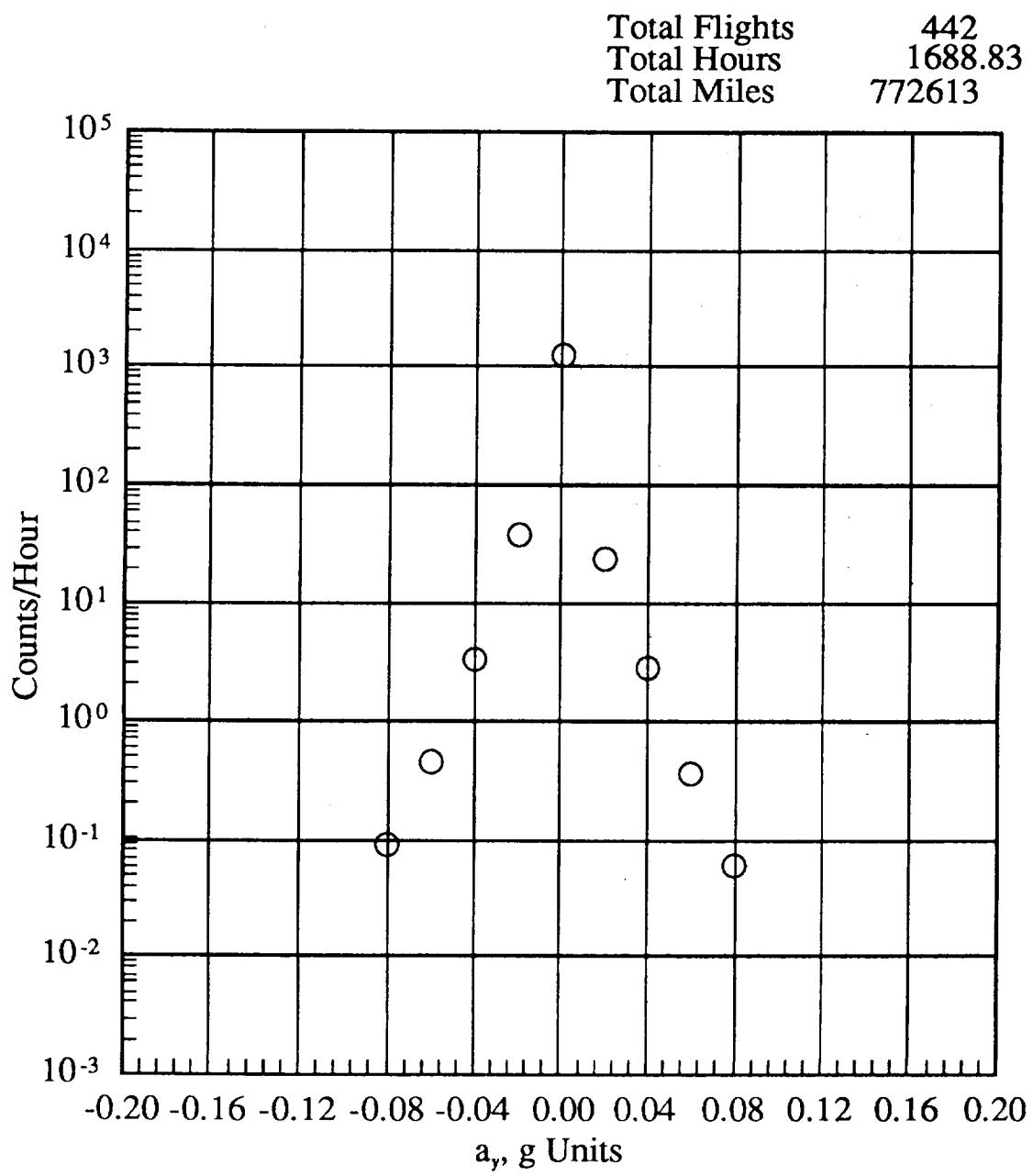
(i) 34500 to 39500 feet altitude

Figure 14.- Continued.



(j) 39500 to 44500 feet altitude

Figure 14.- Continued.



(k) -500 to 44500 feet altitude

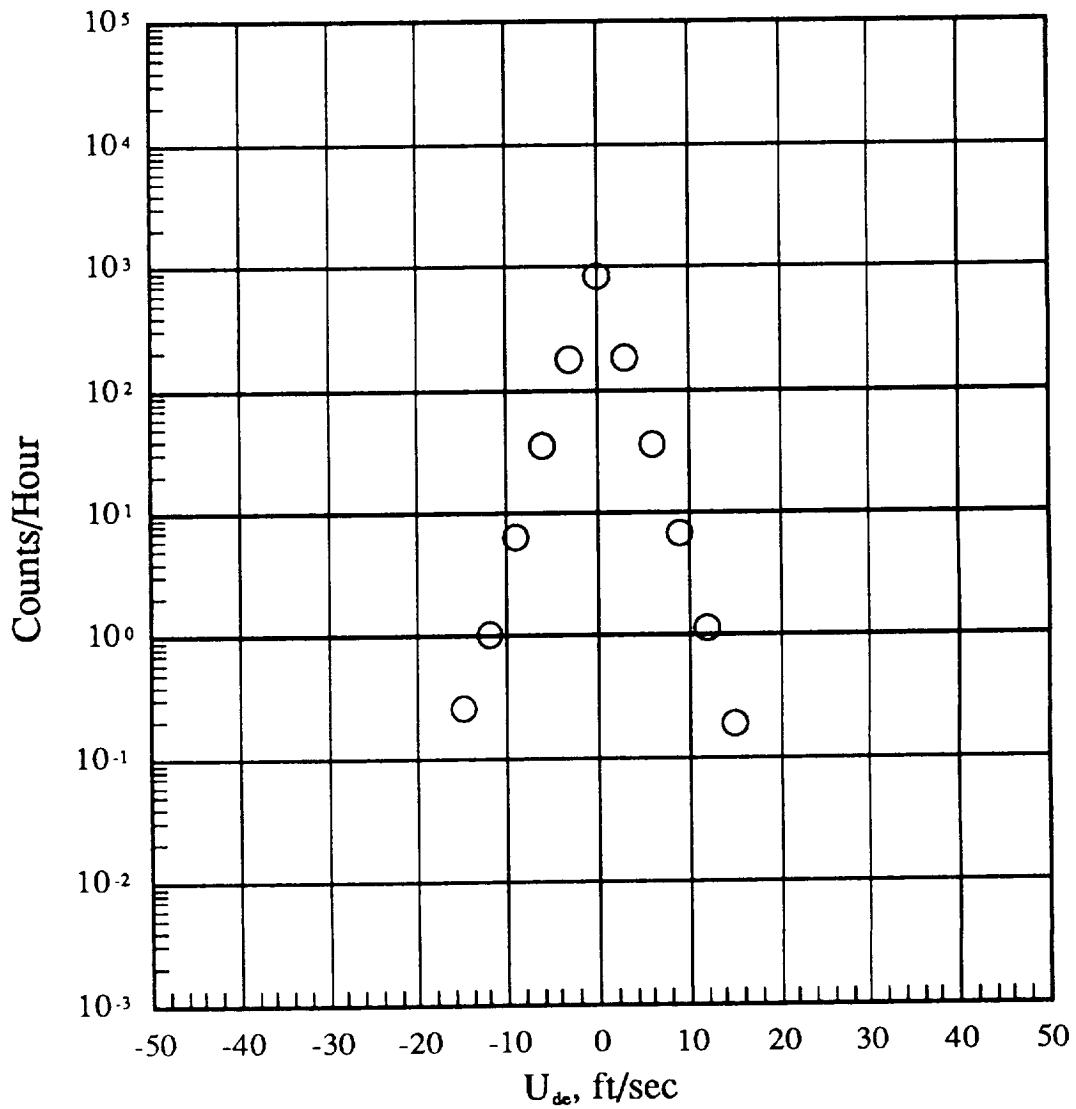
Figure 14.- Concluded.

		PRESSURE ALTITUDE BANDS									
		-500 TO 4500 FT	4500 TO 9500 FT	9500 TO 14500 FT	14500 TO 19500 FT	19500 TO 24500 FT	24500 TO 29500 FT	29500 TO 34500 FT	34500 TO 39500 FT	39500 TO 44500 FT	-500 TO 44500 FT
$U_{de}$	DERIVED GUST VELOCITY LEVEL FT/SEC										
		0	0	0	0	0	0	0	0	0	0
100	0	0	0	0	0	0	0	0	0	0	0
90	0	0	0	0	0	0	0	0	0	0	0
80	0	0	0	0	0	0	0	0	0	0	0
70	0	0	0	0	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0
15	0.19	0.07	0	0	0	0	0	0	0	0	0
12	1.13	0.45	0.04	0.05	0	0	0.01	0	0	0.23	0.06
9	6.74	1.87	0.29	0.14	0	0.03	0.01	0.03	1.02	0.34	
6	36.10	8.14	1.64	0.58	0.14	0.16	0.16	0.20	4.77	1.77	
3	181.56	53.60	12.74	6.74	3.98	2.53	1.96	2.61	24.98	10.94	
0	832.76	849.54	873.74	962.55	1025.26	1085.15	1143.63	1121.41	1088.03	1089.10	
-3	177.06	53.23	12.79	6.72	4.45	2.35	2.08	2.64	25.78	10.82	
-6	35.54	8.83	1.44	0.74	0.23	0.13	0.19	0.23	4.66	1.79	
-9	6.33	1.75	0.35	0.09	0	0.01	0.01	0.03	0.45	0.31	
-12	1.02	0.54	0.02	0	0	0	0	0.01	0	0.06	
-15	0.26	0.17	0	0	0	0	0	0	0	0.02	
-20	0	0.02	0	0	0	0	0	0	0	0	
-30	0	0	0	0	0	0	0	0	0	0	
-40	0	0	0	0	0	0	0	0	0	0	
-50	0	0	0	0	0	0	0	0	0	0	
-60	0	0	0	0	0	0	0	0	0	0	
-70	0	0	0	0	0	0	0	0	0	0	
-80	0	0	0	0	0	0	0	0	0	0	
-90	0	0	0	0	0	0	0	0	0	0	
-100	0	0	0	0	0	0	0	0	0	0	
FLIGHT HOURS @ ALT	57.68	57.61	54.89	43.48	48.52	79.06	273.34	1065.45	8.81	1688.83	
FLIGHT MILES @ ALT	10712.91	14655.73	18759.60	17393.17	21054.53	36267.12	133304.10	516103.63	4282.14	772612.93	
TOTAL FLIGHTS									442		
TOTAL FLIGHT HOURS FLAPS UP AND DOWN									1688.83		
TOTAL FLIGHT MILES FLAPS UP AND DOWN									772612.93		

(a)  $U_{de}$  Level crossing counts per hour within pressure altitude bands

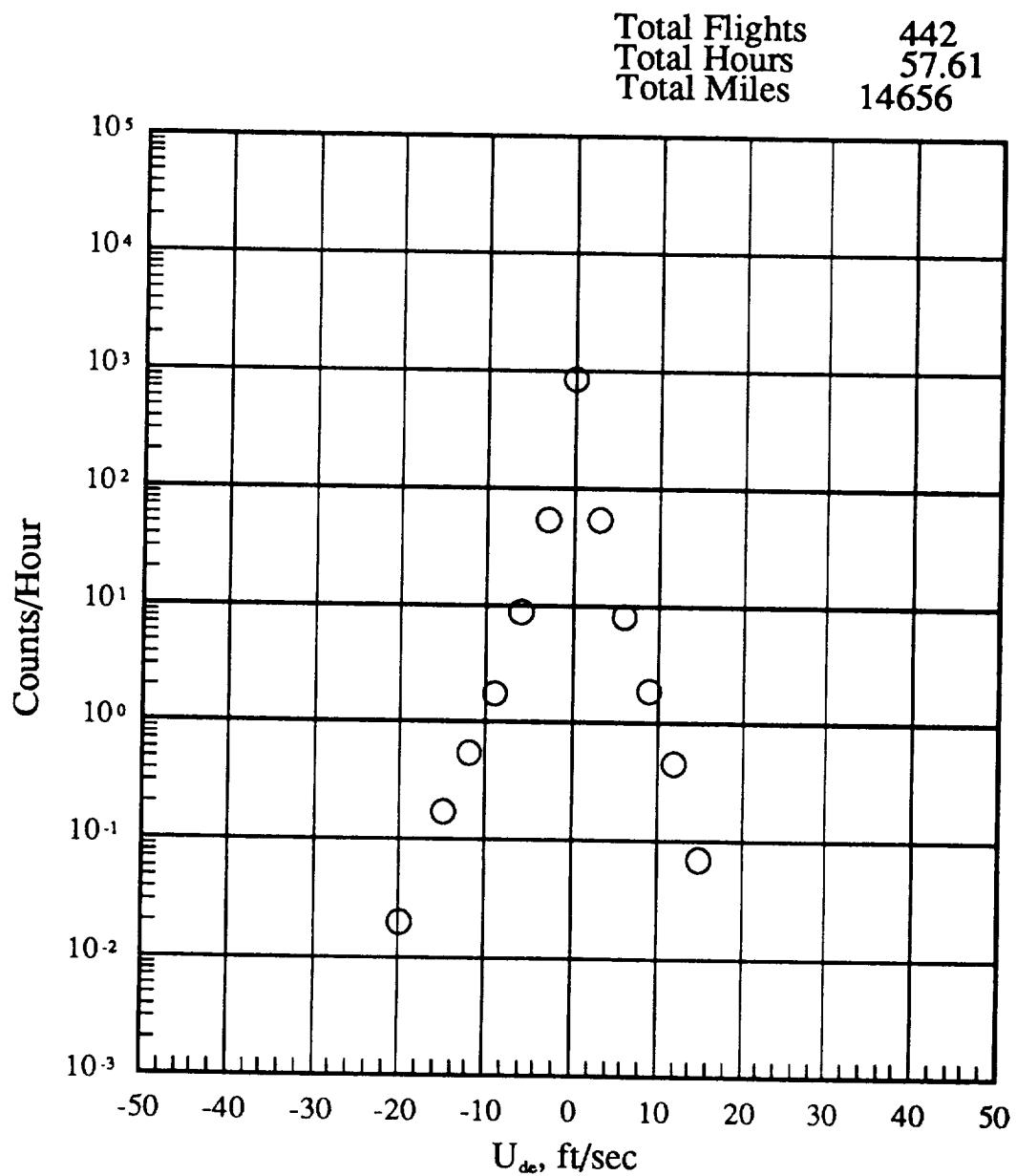
Figure 15.-  $U_{de}$  exceedances.

Total Flights      442  
 Total Hours        57.68  
 Total Miles       10718



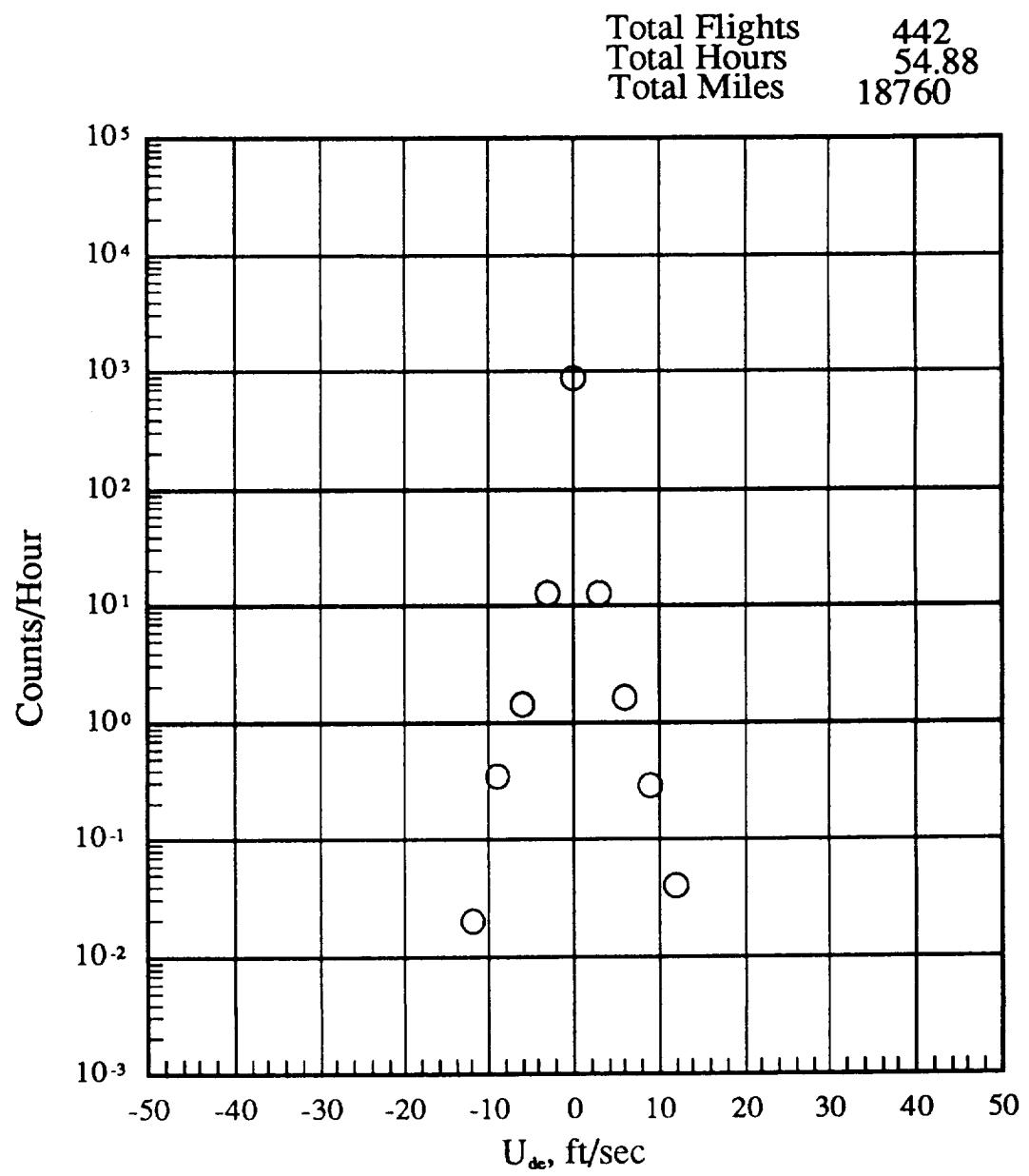
(b) -500 to 4500 feet altitude

Figure 15.- Continued.



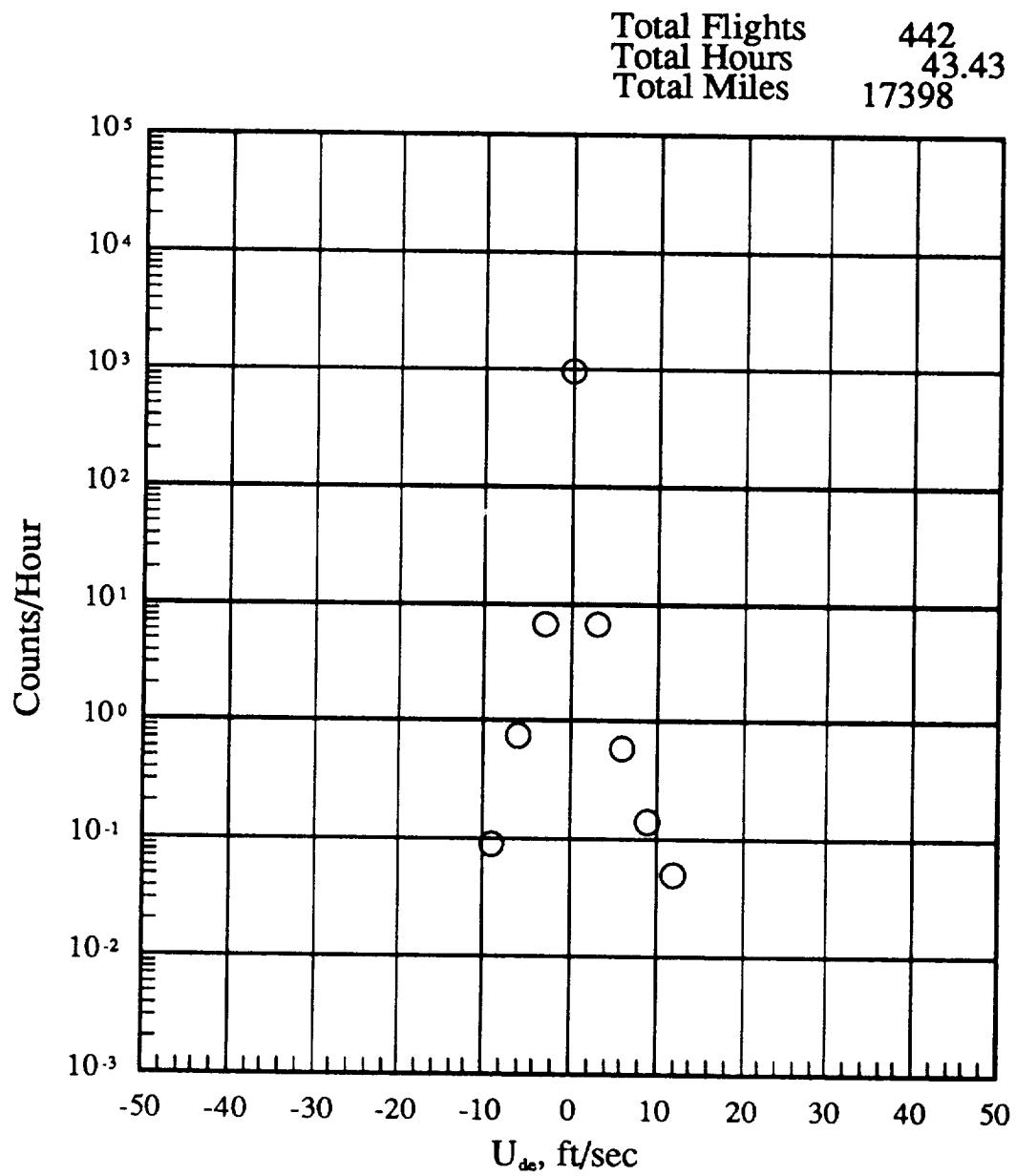
(c) 4500 to 9500 feet altitude

Figure 15.- Continued.



(d) 9500 to 14500 feet altitude

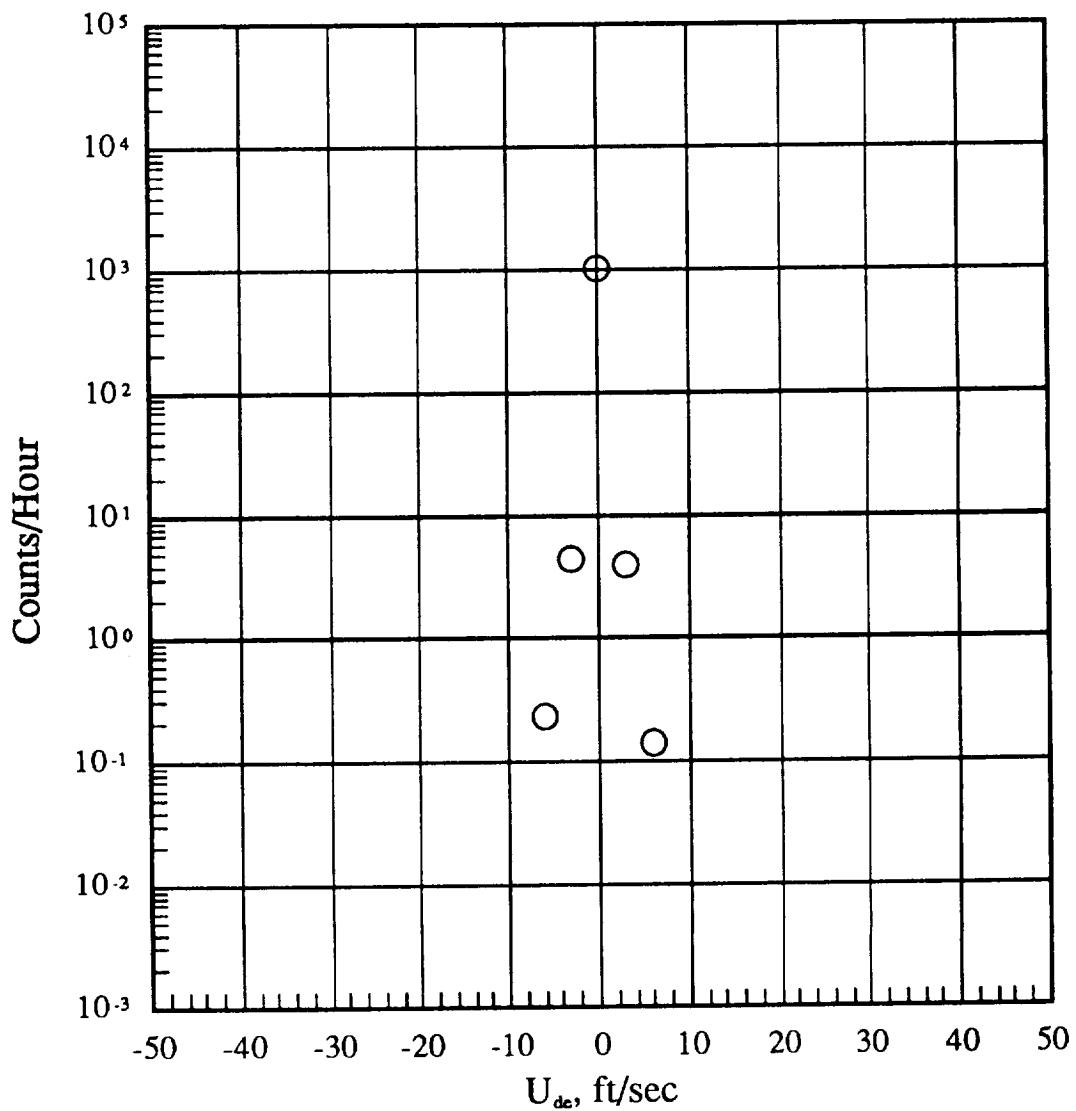
Figure 15.- Continued.



(e) 14500 to 19500 feet altitude

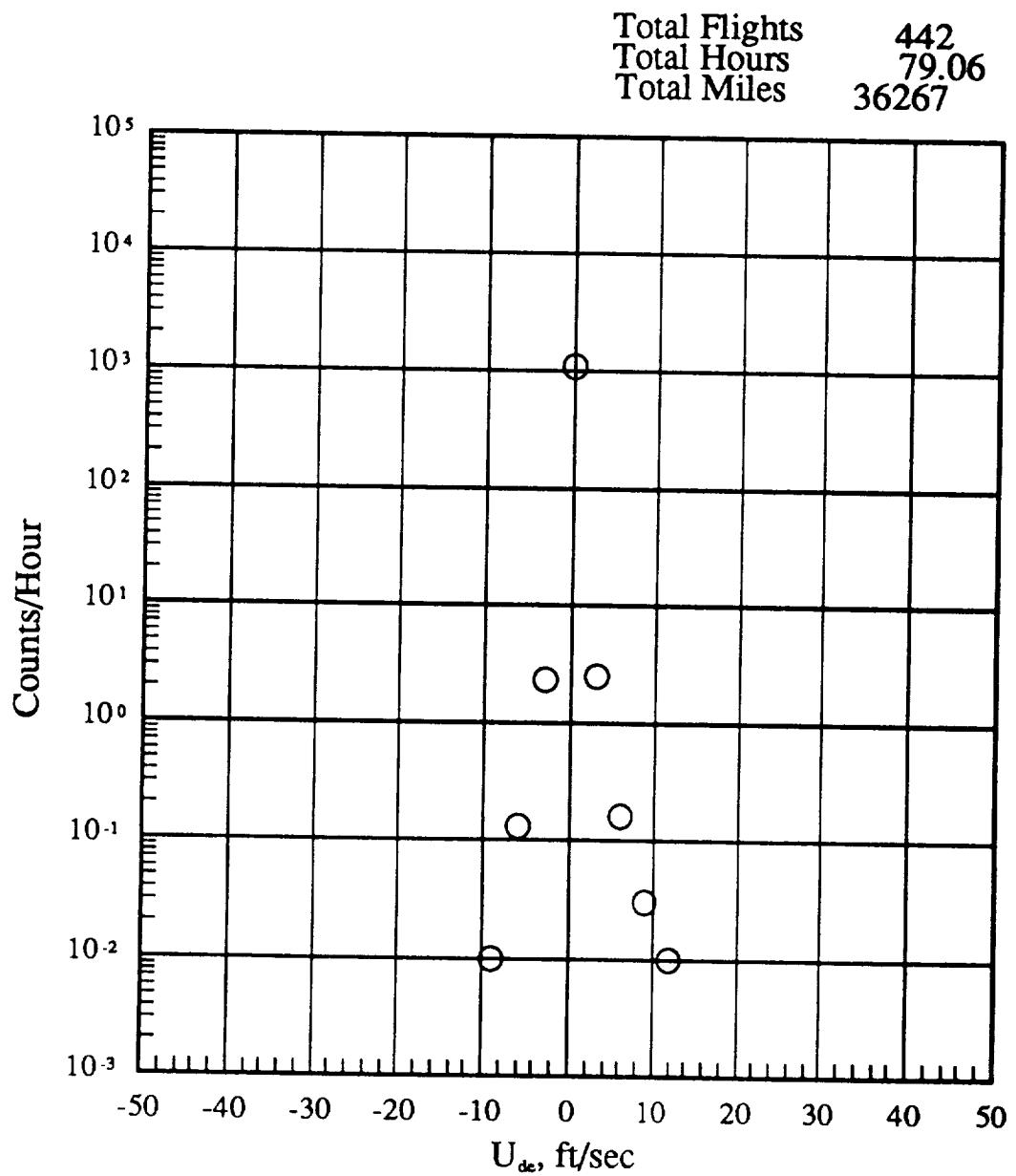
Figure 15.- Continued.

Total Flights      442  
 Total Hours      48.52  
 Total Miles      21055



(f) 19500 to 24500 feet altitude

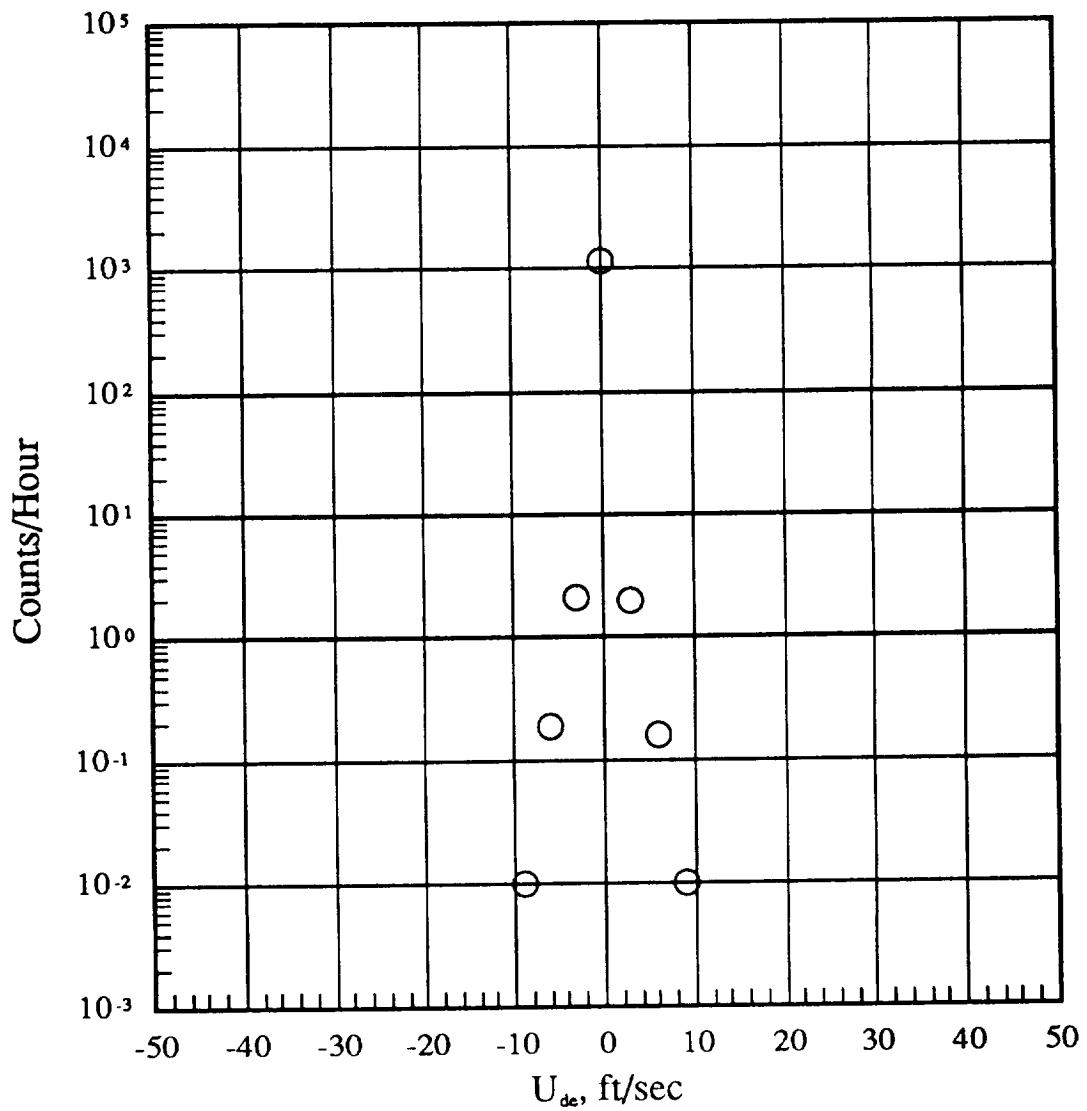
Figure 15.- Continued.



(g) 24500 to 29500 feet altitude

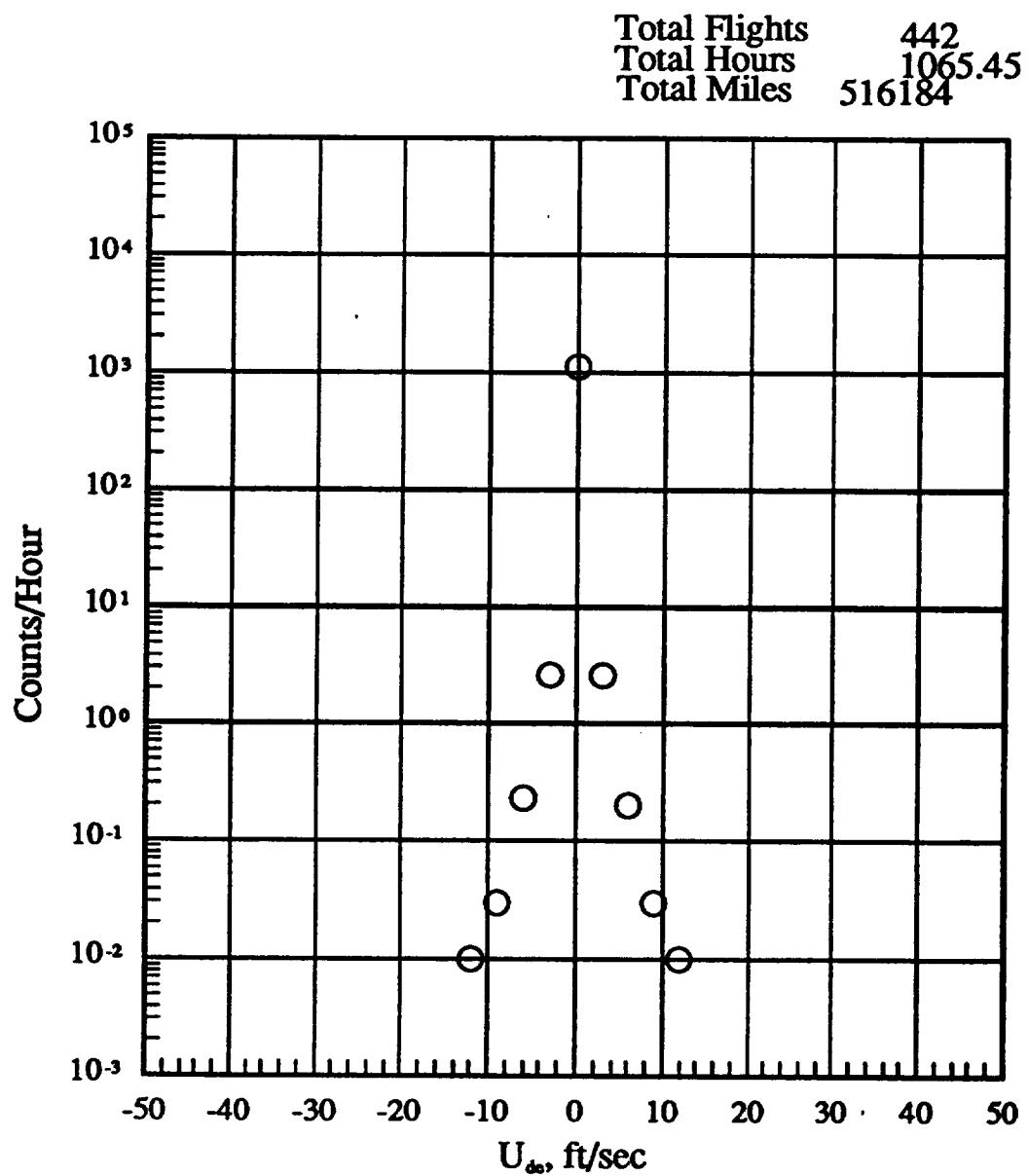
Figure 15.- Continued.

Total Flights      442  
Total Hours      273.34  
Total Miles      133304



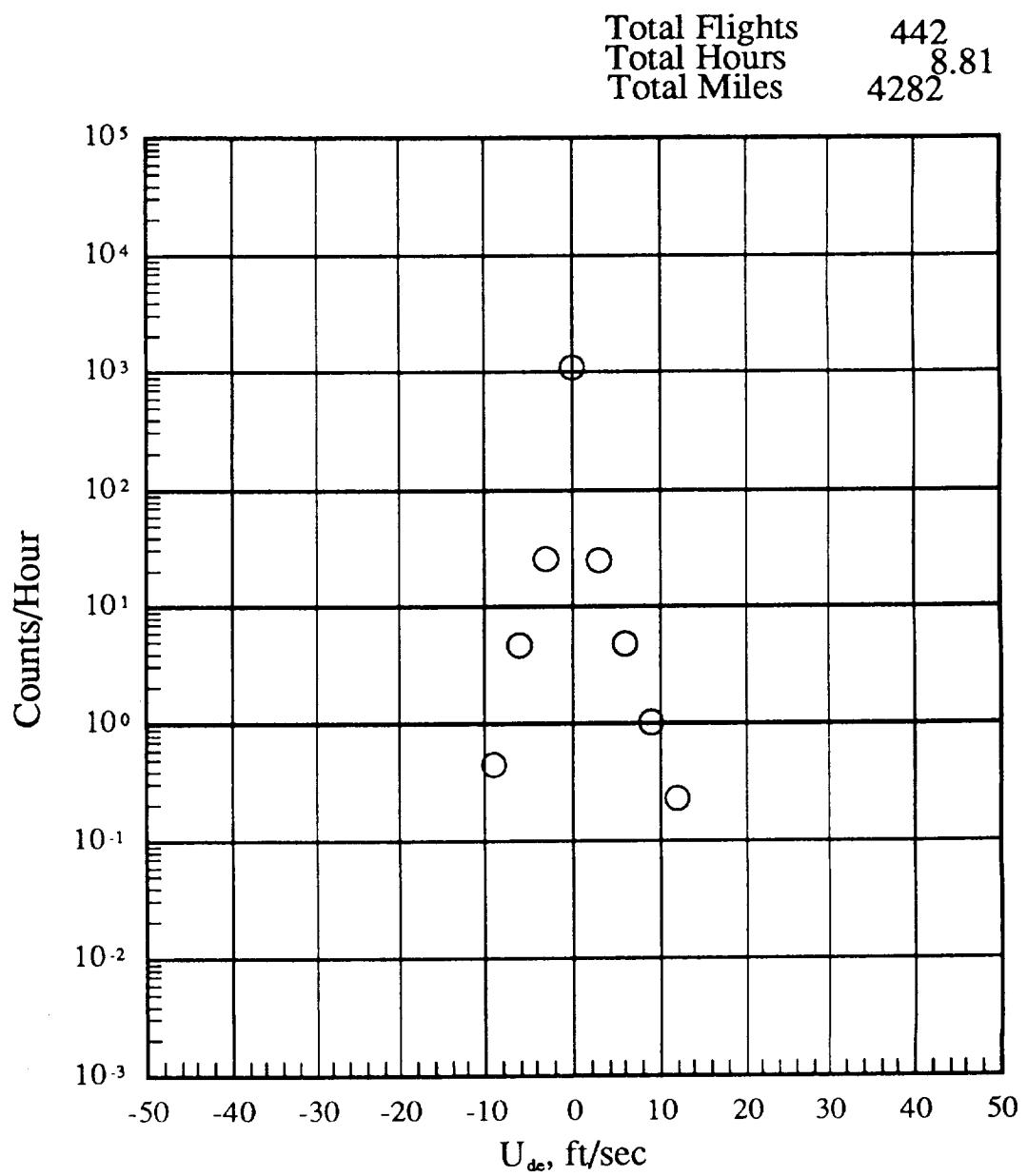
(h) 29500 to 34500 feet altitude

Figure 15.- Continued.



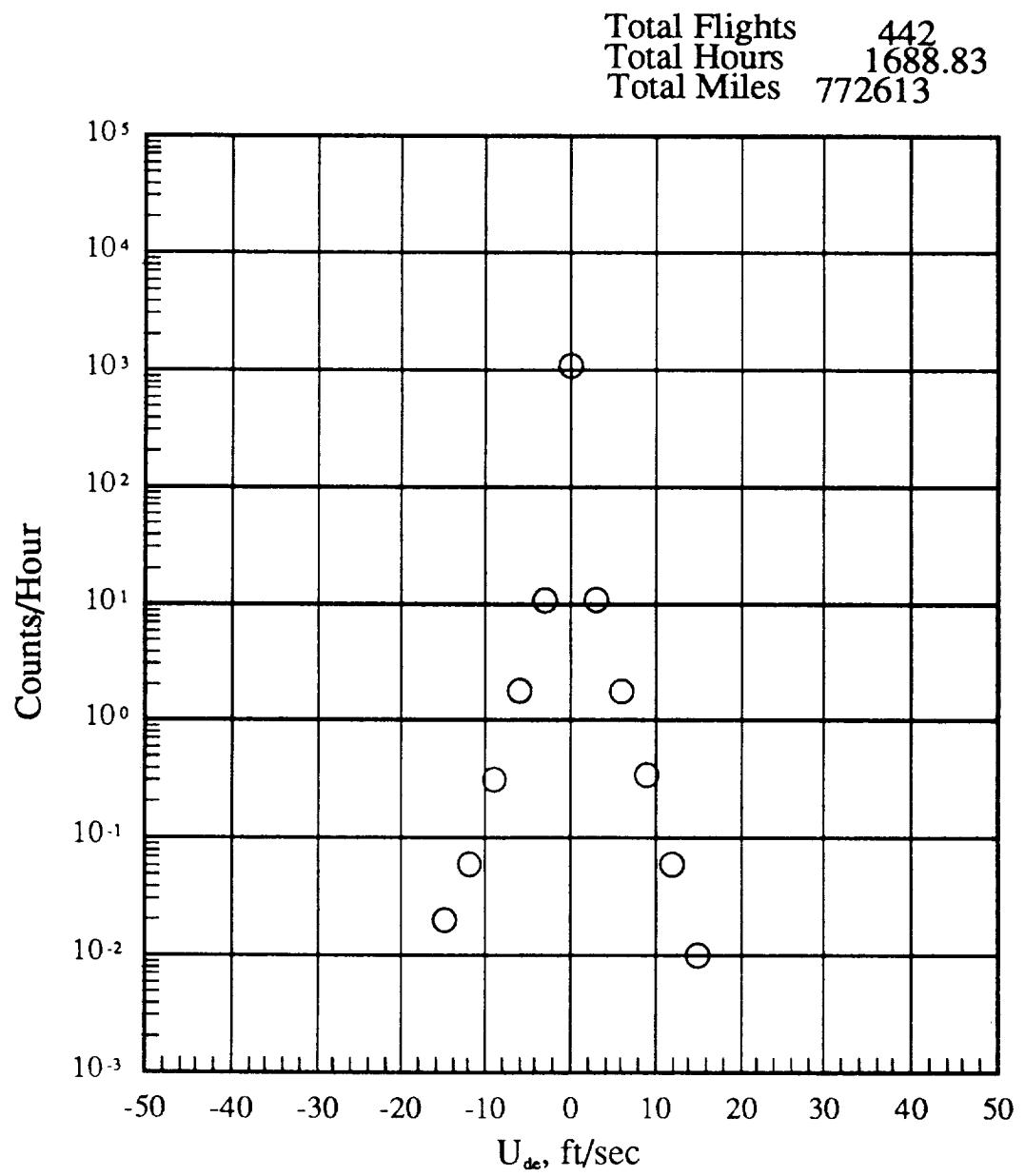
(i) 34500 to 39500 feet altitude

Figure 15.- Continued.



(j) 39500 to 44500 feet altitude

Figure 15.- Continued.



(k) -500 to 44500 feet altitude

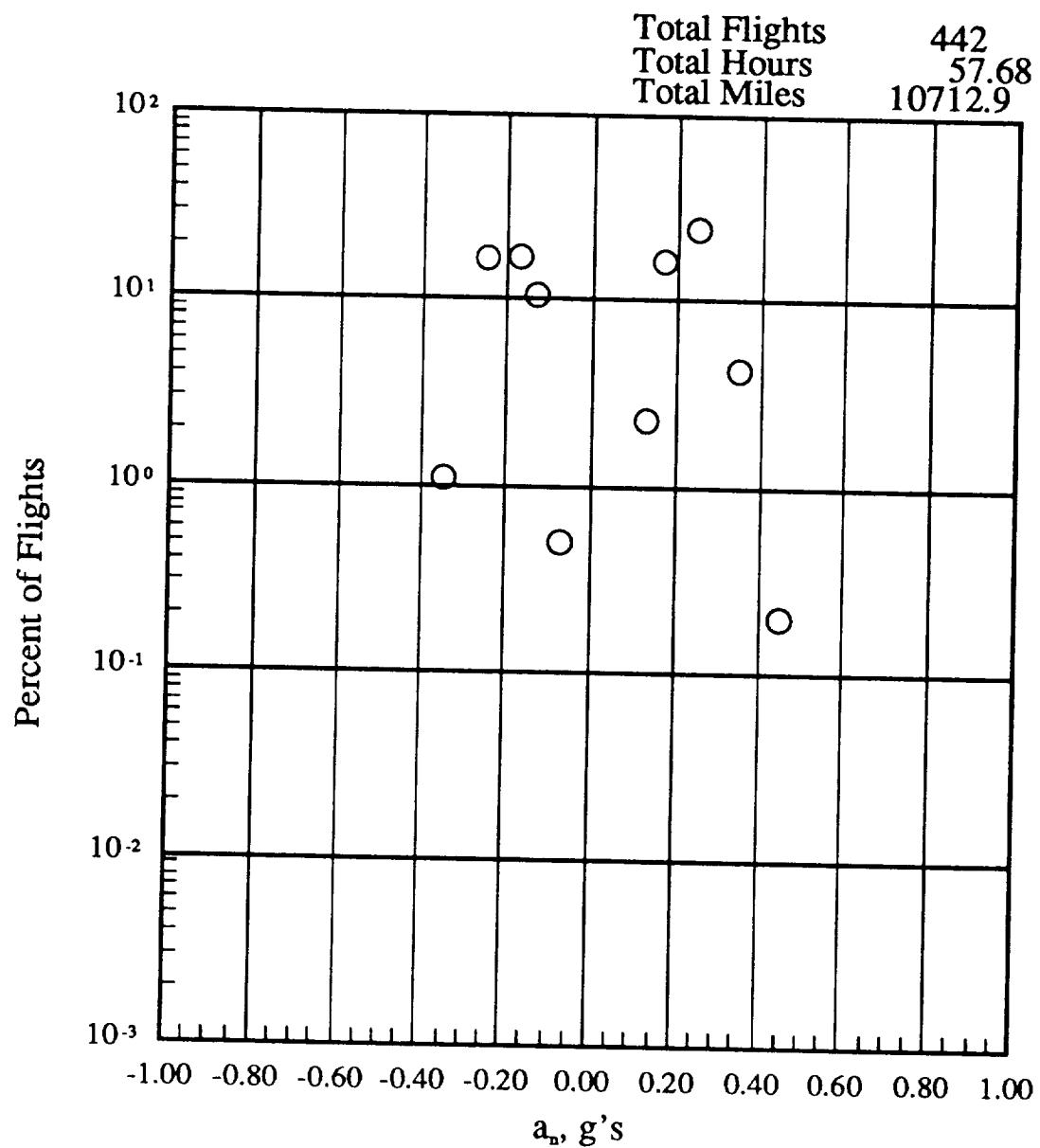
Figure 15.- Concluded

PRESSURE ALTITUDE BANDS

MAXIMUM $a_n$	LEVEL FOR EACH FLIGHT	-500 TO 4500 FT				4500 TO 9500 FT				9500 TO 14500 FT				14500 TO 19500 FT				19500 TO 24500 FT				24500 TO 29500 FT				29500 TO 34500 FT				34500 TO 39500 FT				39500 TO 44500 FT			
		-500 TO 4500 FT	4500 TO 9500 FT	9500 TO 14500 FT	14500 TO 19500 FT	19500 TO 24500 FT	24500 TO 29500 FT	29500 TO 34500 FT	34500 TO 39500 FT	39500 TO 44500 FT	44500 TO 49500 FT																										
1.60	1.80	0	0	0	0	0	0	0	0	0	0																										
1.40	1.60	0	0	0	0	0	0	0	0	0	0																										
1.20	1.40	0	0	0	0	0	0	0	0	0	0																										
1.00	1.20	0	0	0	0	0	0	0	0	0	0																										
.80	1.00	0	0	0	0	0	0	0	0	0	0																										
.70	0.80	0	0	0	0	0	0	0	0	0	0																										
.60	0.70	0	0	0	0	0	0	0	0	0	0																										
.50	0.60	0	0.2	0	0.2	0	0.2	0	0.2	0	0.2																										
.40	0.50	0.2	0.2	0.5	0.2	0	0.2	0	0.2	0.2	0.2																										
.30	0.40	4.3	4.1	0.7	0.7	0.2	0.2	0.2	0.2	1.6	1.6																										
.20	0.30	24.4	12.0	3.6	0.9	0.9	1.1	1.1	1.8	3.6	3.6																										
.15	0.20	16.3	6.3	1.8	1.4	0	1.1	0.9	2.0	0.2	0.2																										
.10	0.15	2.3	1.6	0	0	0	0.2	0.5	0.7	0	0.8																										
.05	0.10	0	0	0	0	0	0	0	0	0	0																										
-.05	-.10	0.5	0.2	0	0.2	0	0	0.5	0.7	0.2	1.1																										
-.10	-.05	10.6	1.6	0.9	0	0.2	0.5	0.7	2.7	2.7	17.4																										
-.15	-.02	17.0	6.3	2.9	1.1	0.9	0.9	2.7	2.9	0.2	35.1																										
-.20	-.30	16.7	9.0	1.6	1.1	0.5	0.5	1.6	8.1	0	39.1																										
-.30	-.40	1.1	2.5	0.5	0	0	0	0.2	1.1	0	5.4																										
-.40	-.50	0	0	0	0	0	0	0.2	0.7	0.2	1.1																										
-.50	-.60	0	0.2	0	0	0	0	0	0	0.2	0.5																										
-.60	-.70	0	0	0	0	0	0	0	0	0	0																										
-.70	-.80	0	0	0	0	0	0	0	0	0	0																										
-.80	-.90	0	0	0	0	0	0	0	0	0	0																										
-.90	-.100	0	0	0	0	0	0	0	0	0	0																										
-.100	-.120	0	0	0	0	0	0	0	0	0	0																										
-.120	-.140	0	0	0	0	0	0	0	0	0	0																										
-.140	-.160	0	0	0	0	0	0	0	0	0	0																										
-.160	-.180	0	0	0	0	0	0	0	0	0	0																										
FLIGHT HOURS & ALT		57.68	57.61	54.89	43.48	48.52	79.06	273.34	1065.45	8.81	1688.83																										
FLIGHT MILES & ALT		10712.91	14655.73	18759.60	17393.17	21054.53	36267.13	133304.11	516183.66	4282.14	772612.98																										
TOTAL FLIGHTS																																					

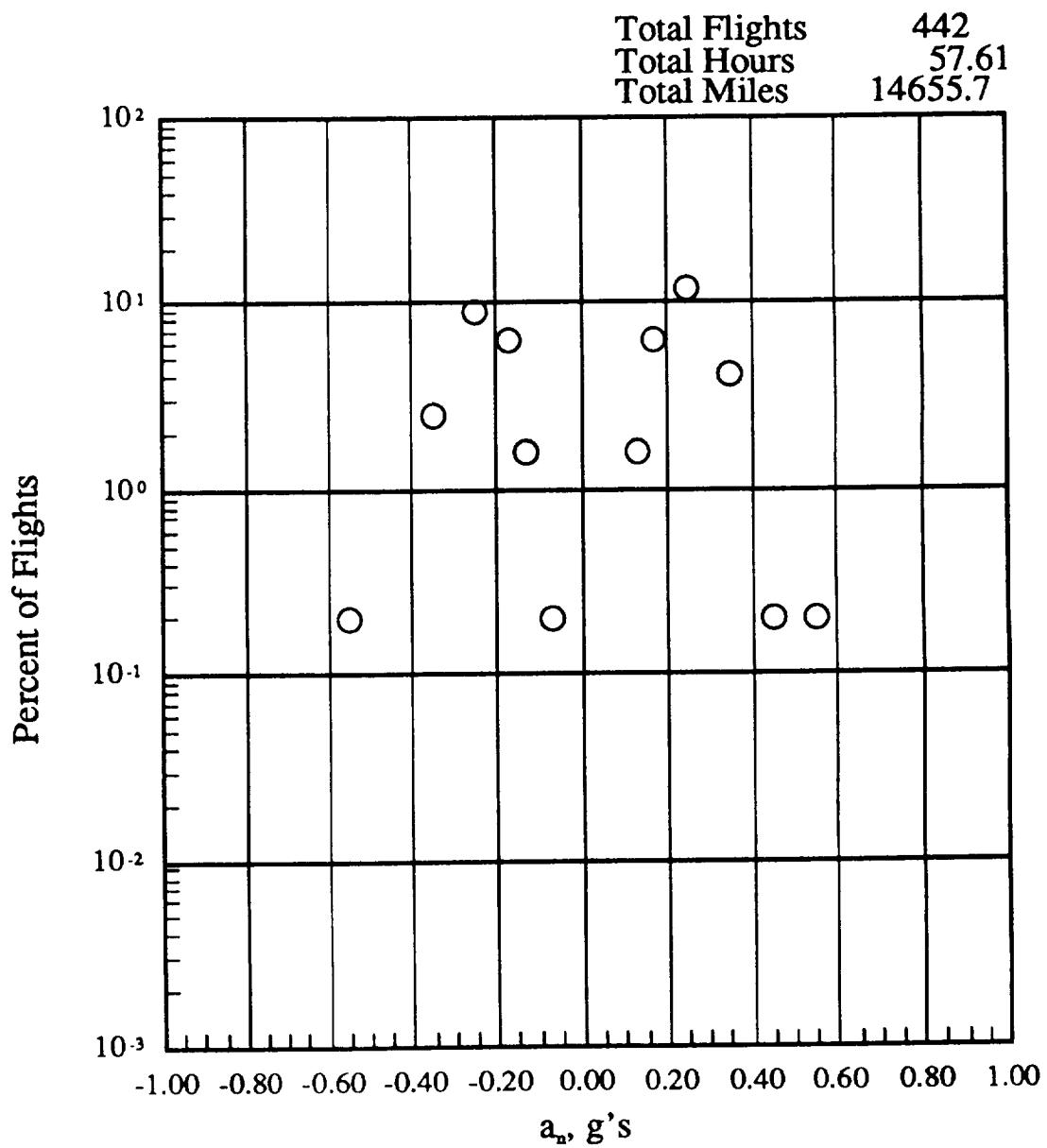
(a) Percent of flights where peak positive and negative  $a_n$  per flight occurs within pressure altitude bands, any flap

Figure 16.- Peak positive and negative  $a_n$  vs altitude.



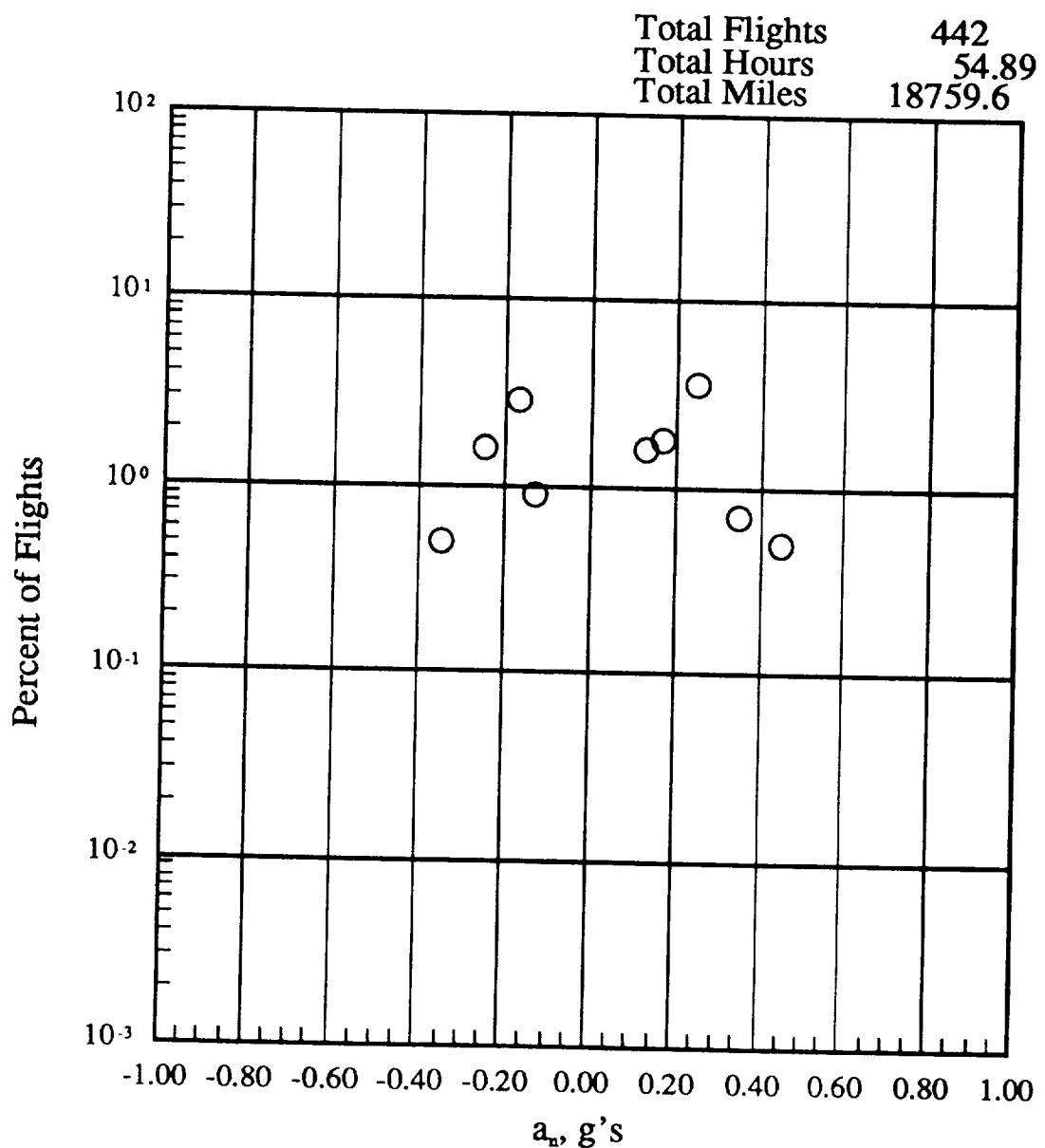
(b) -500 to 4500 feet altitude

Figure 16.- Continued.



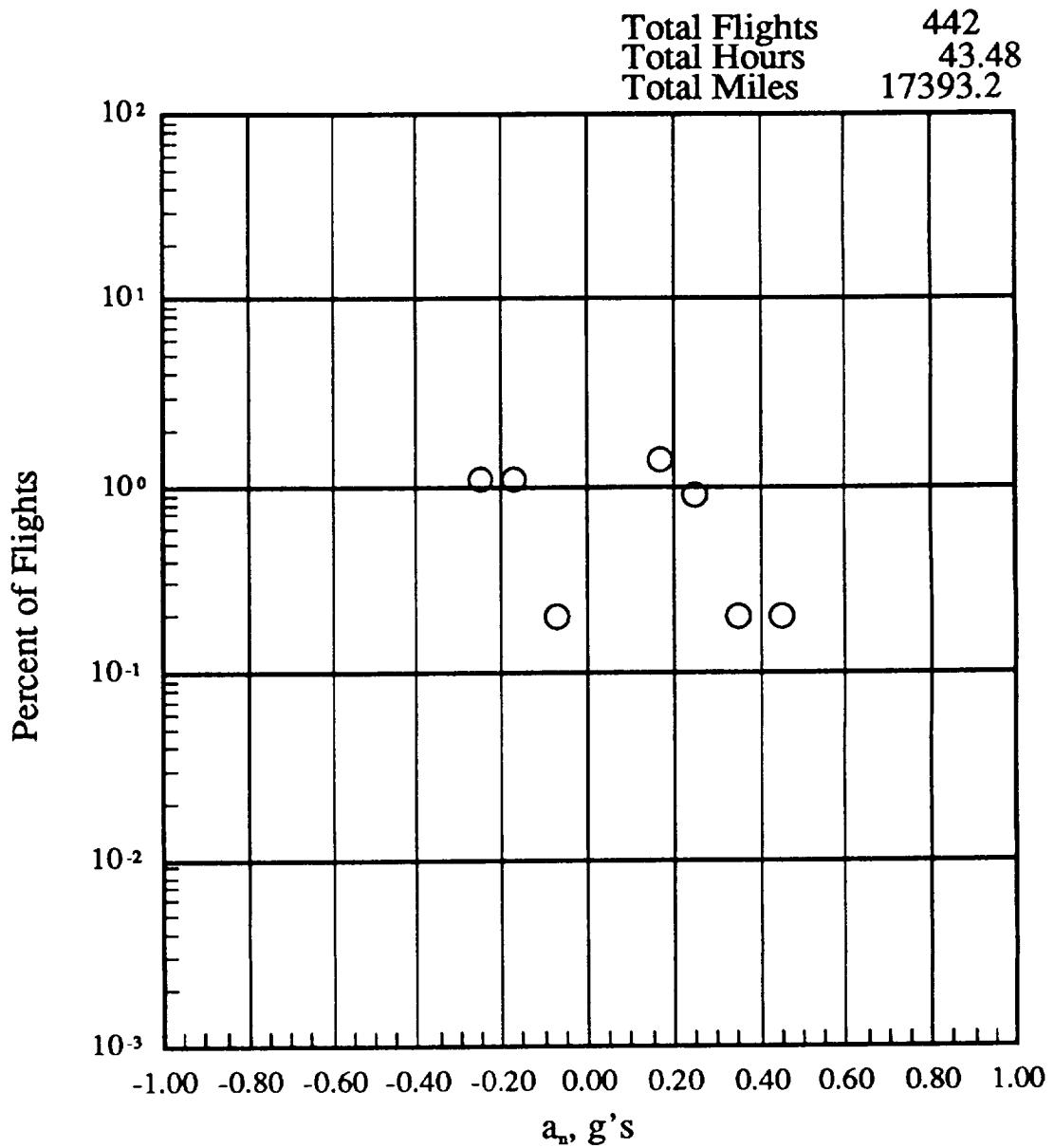
(c) 4500 to 9500 feet altitude

Figure 16.- Continued.



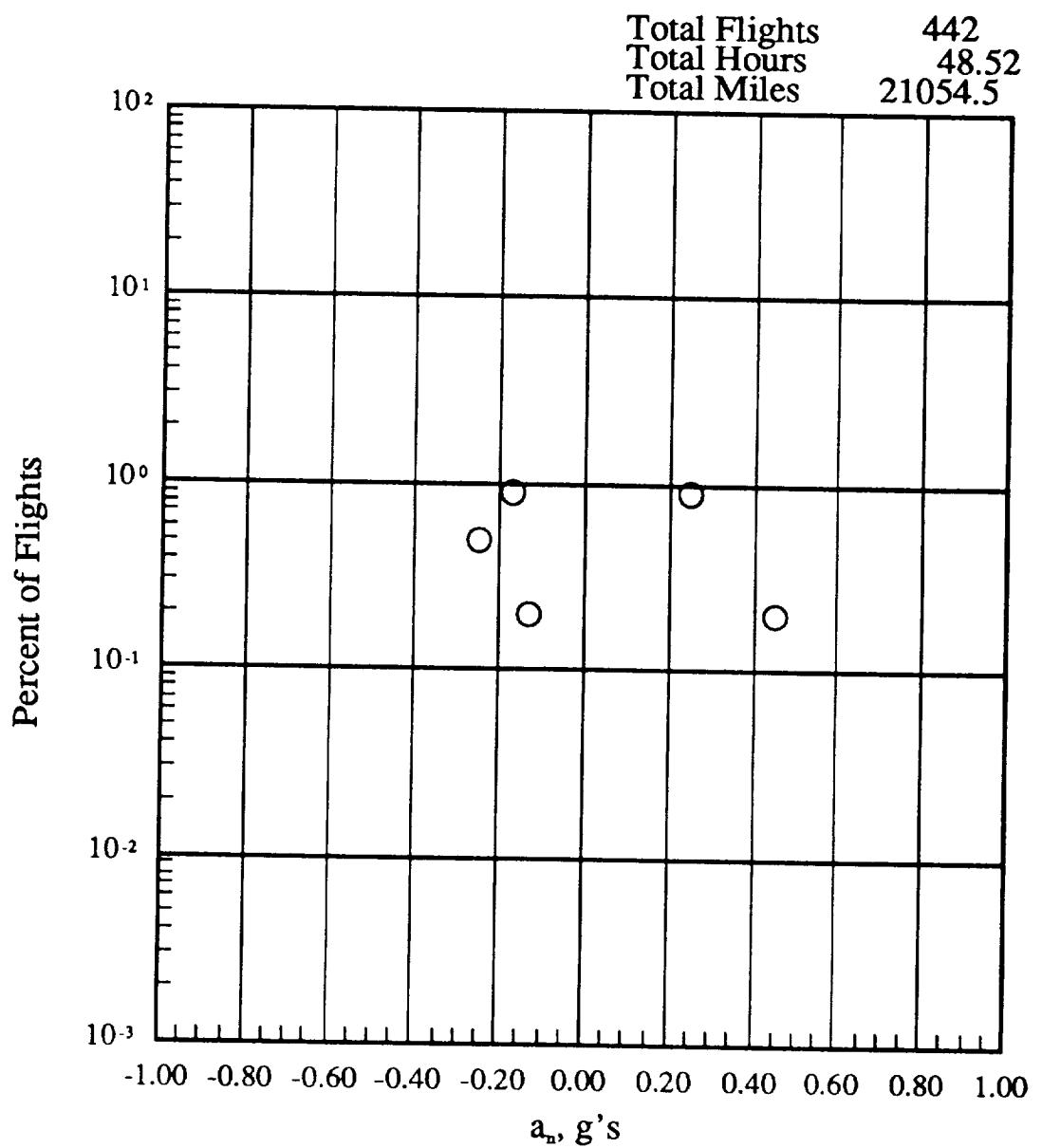
(d) 9500 to 14500 feet altitude

Figure 16.- Continued.



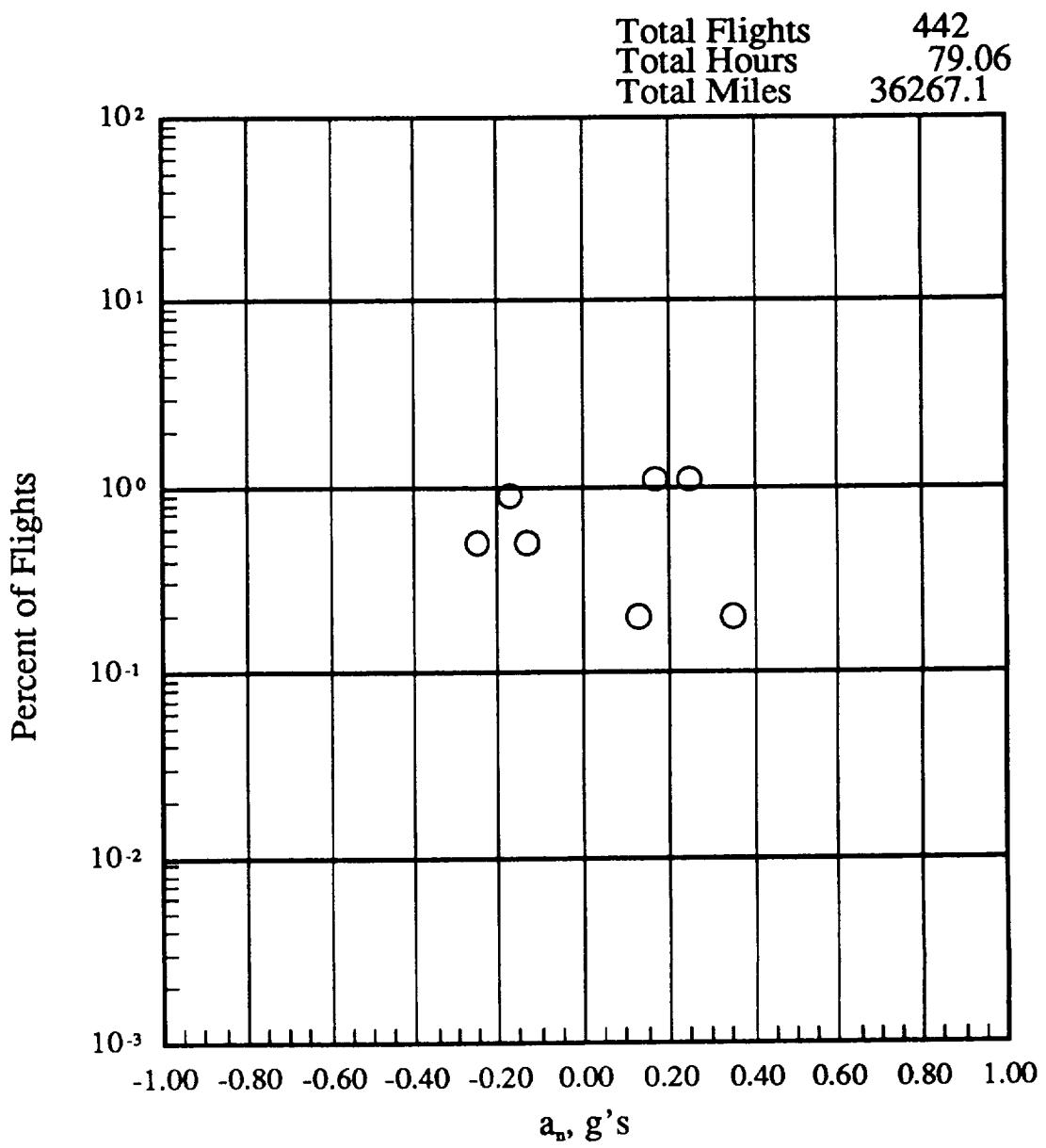
(e) 14500 to 19500 feet altitude

Figure 16.- Continued.



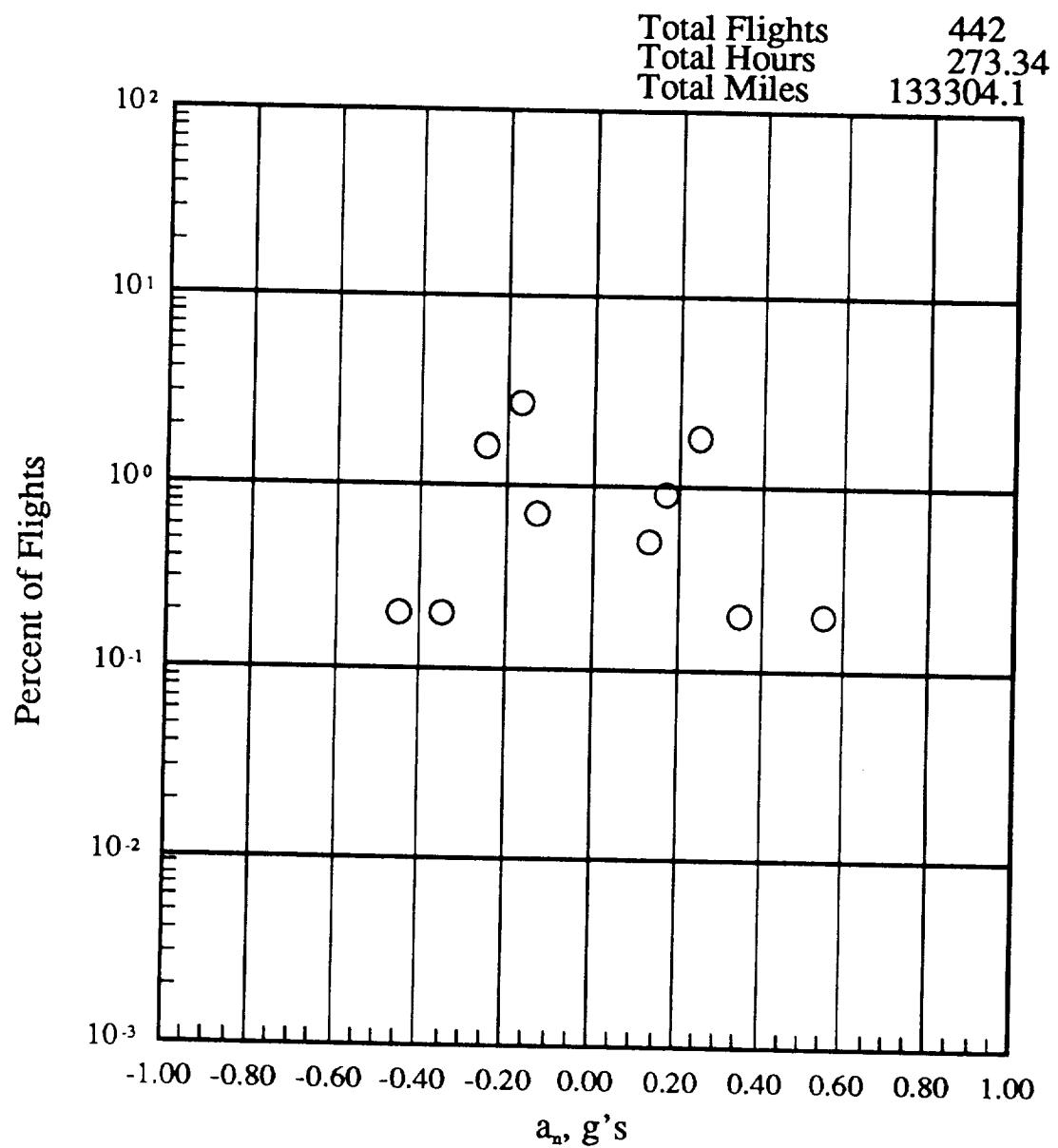
(f) 19500 to 24500 feet altitude

Figure 16.- Continued.



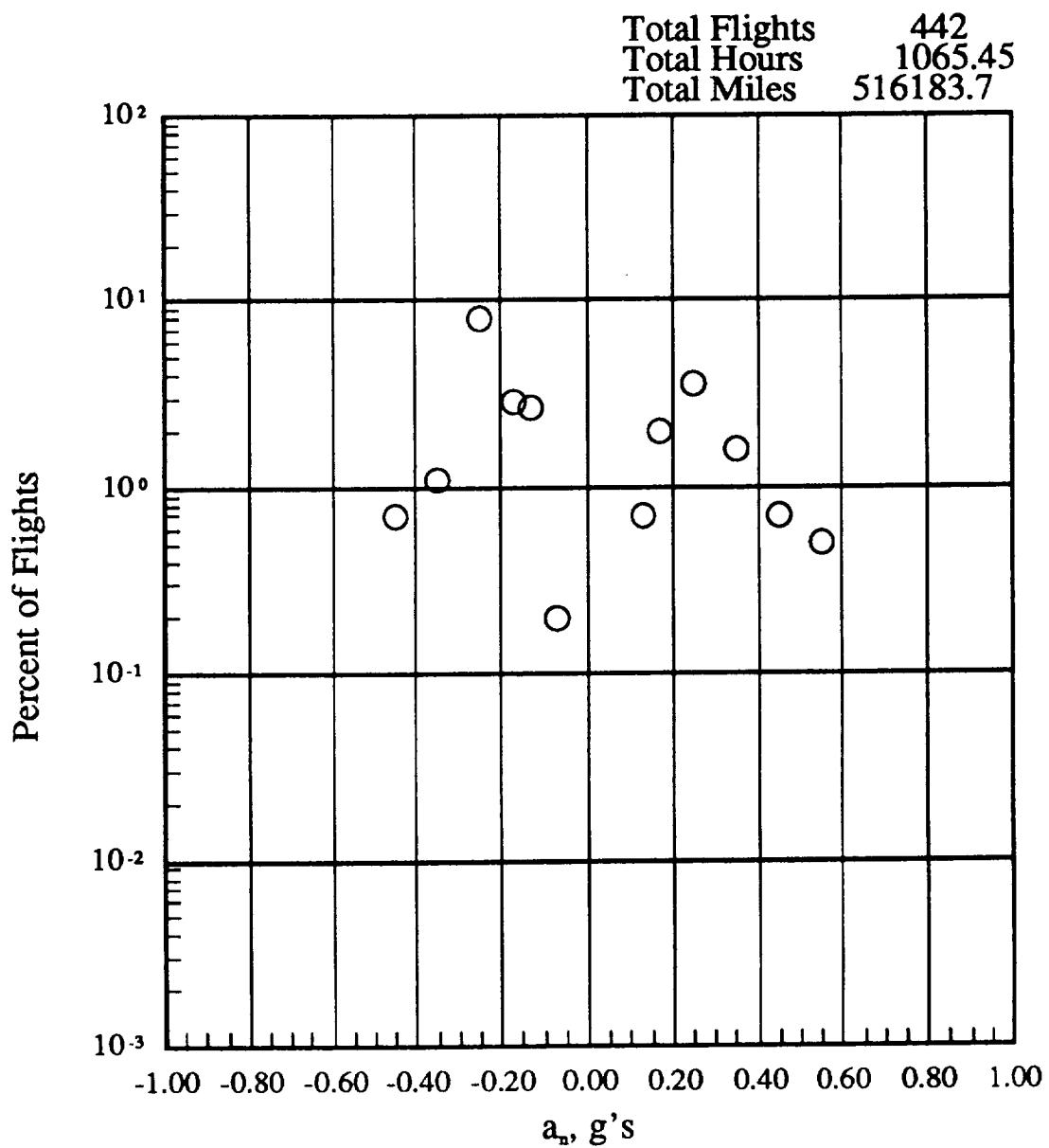
(g) 24500 to 29500 feet altitude

Figure 16.- Continued.



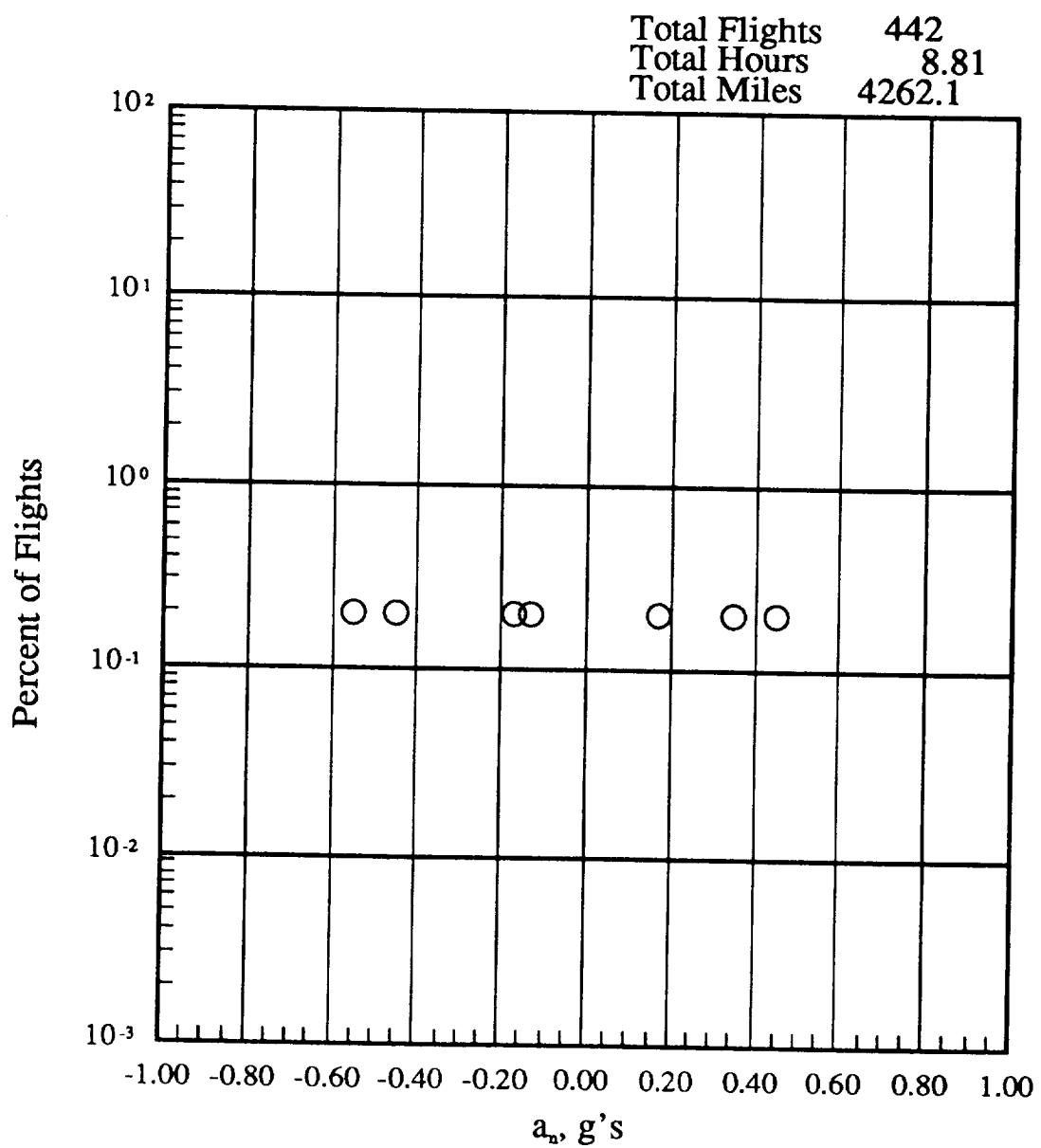
(h) 29500 to 34500 feet altitude

Figure 16.- Continued.



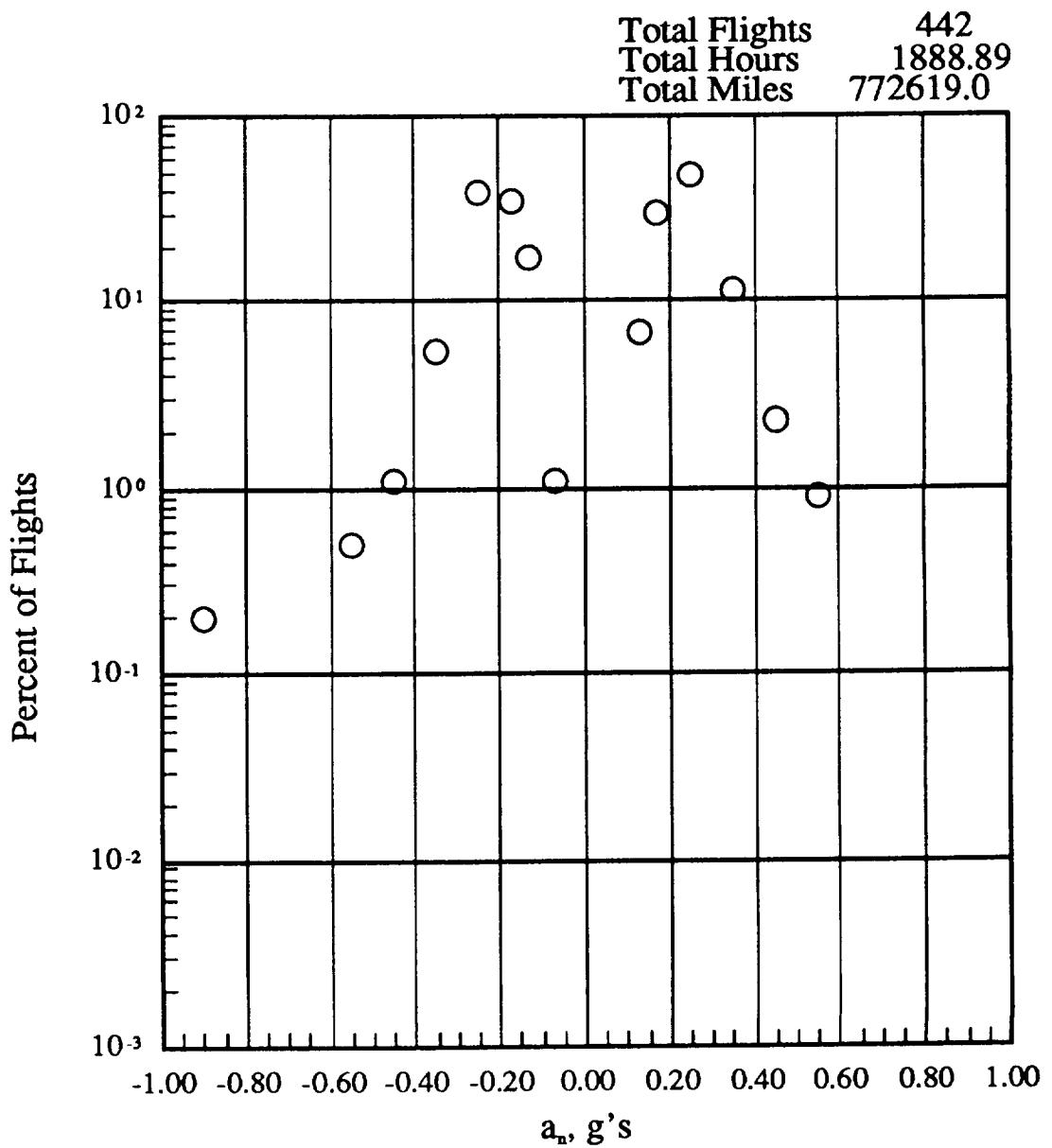
(i) 34500 to 39500 feet altitude

Figure 16.- Continued.



(j) 39500 to 44500 feet altitude

Figure 16.- Continued.



(k) -500 to 44500 feet altitude

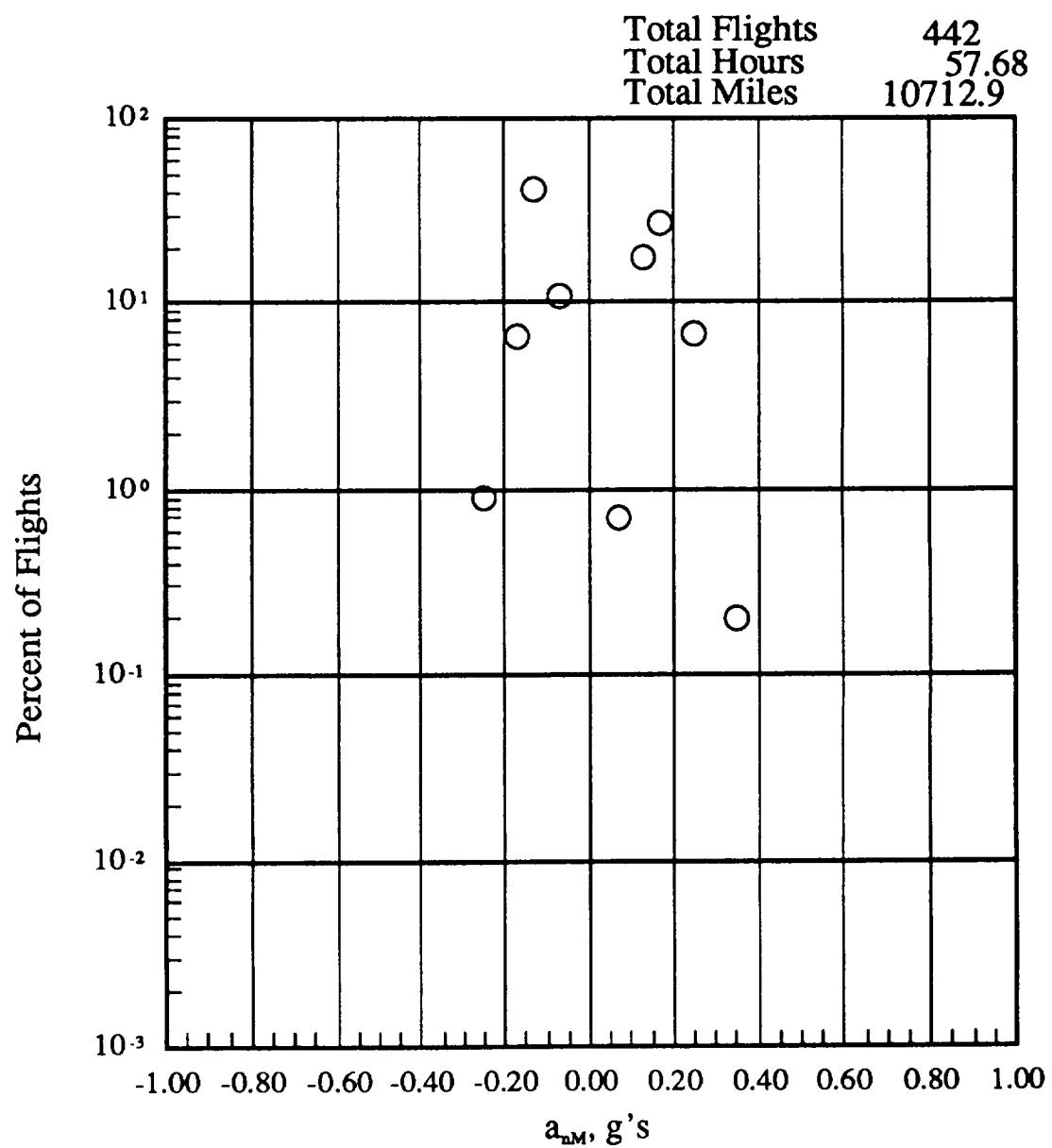
Figure 16.- Concluded.

PRESSURE ALTITUDE BANDS

MAXIMUM $a_{nM}$	LEVEL FOR EACH FLIGHT	PRESSURE ALTITUDE BANDS									
		-500 TO 4500 FT	4500 TO 9500 FT	9500 TO 14500 FT	14500 TO 19500 FT	19500 TO 24500 FT	24500 TO 29500 FT	29500 TO 34500 FT	34500 TO 39500 FT	39500 TO 44500 FT	-500 TO 44500 FT
.160	1.80	0	0	0	0	0	0	0	0	0	0
1.40	1.60	0	0	0	0	0	0	0	0	0	0
1.20	1.40	0	0	0	0	0	0	0	0	0	0
1.00	1.20	0	0	0	0	0	0	0	0	0	0
.80	1.00	0	0	0	0	0	0	0	0	0	0
.70	0.80	0	0	0	0	0	0	0	0	0	0
.60	0.70	0	0	0	0	0	0	0	0	0	0
.50	0.60	0	0	0	0	0	0	0	0	0	0
.40	0.50	0	0	0	0	0	0	0	0	0	0
.30	0.40	0.2	0.5	0	0	0.2	0	0	0.2	0	0.1
.20	0.30	6.8	4.5	1.6	0.2	0.2	0.2	0	0.2	0.2	13.8
.15	0.20	27.1	12.9	1.1	0.9	0.2	0.5	0.2	1.6	0	44.6
.10	0.15	17.6	9.7	4.8	0.9	0.5	0	0.9	1.6	0.2	36.2
.05	0.10	0.7	1.1	0.7	0	0.2	0.9	0.7	0	0	4.3
-.05	-0.10	10.9	4.1	2.3	0	0.5	0	0.5	2.0	0	20.1
-.10	-0.15	41.4	11.1	2.5	1.4	0.9	1.4	2.3	5.0	0.7	66.5
-.15	-0.20	6.6	2.7	0	0.2	0.2	0	0	1.8	0	11.5
-.20	-0.30	0.9	0.2	0	0	0	0	0	0.5	0.2	1.8
-.30	-0.40	0	0	0	0	0	0	0	0	0	0
-.40	-0.50	0	0	0	0	0	0	0	0	0	0
-.50	-0.60	0	0	0	0	0	0	0	0	0	0
-.60	-0.70	0	0	0	0	0	0	0	0	0	0
-.70	-0.80	0	0	0	0	0	0	0	0	0	0
-.80	-1.00	0	0	0	0	0	0	0	0	0	0
-.90	-1.20	0	0	0	0	0	0	0	0	0	0
-1.00	-1.40	0	0	0	0	0	0	0	0	0	0
-1.20	-1.60	0	0	0	0	0	0	0	0	0	0
-1.40	-1.80	0	0	0	0	0	0	0	0	0	0
-1.60	-1.80	0	0	0	0	0	0	0	0	0	0
FLIGHT HOURS @ ALT	57.68	57.61	54.89	43.48	48.52	79.06	273.34	1065.45	8.81	1688.83	
FLIGHT MILES @ ALT	10712.91	14655.73	18759.60	17393.17	21054.53	36267.13	133304.11	516183.66	4282.14	772612.98	
TOTAL FLIGHTS									442		

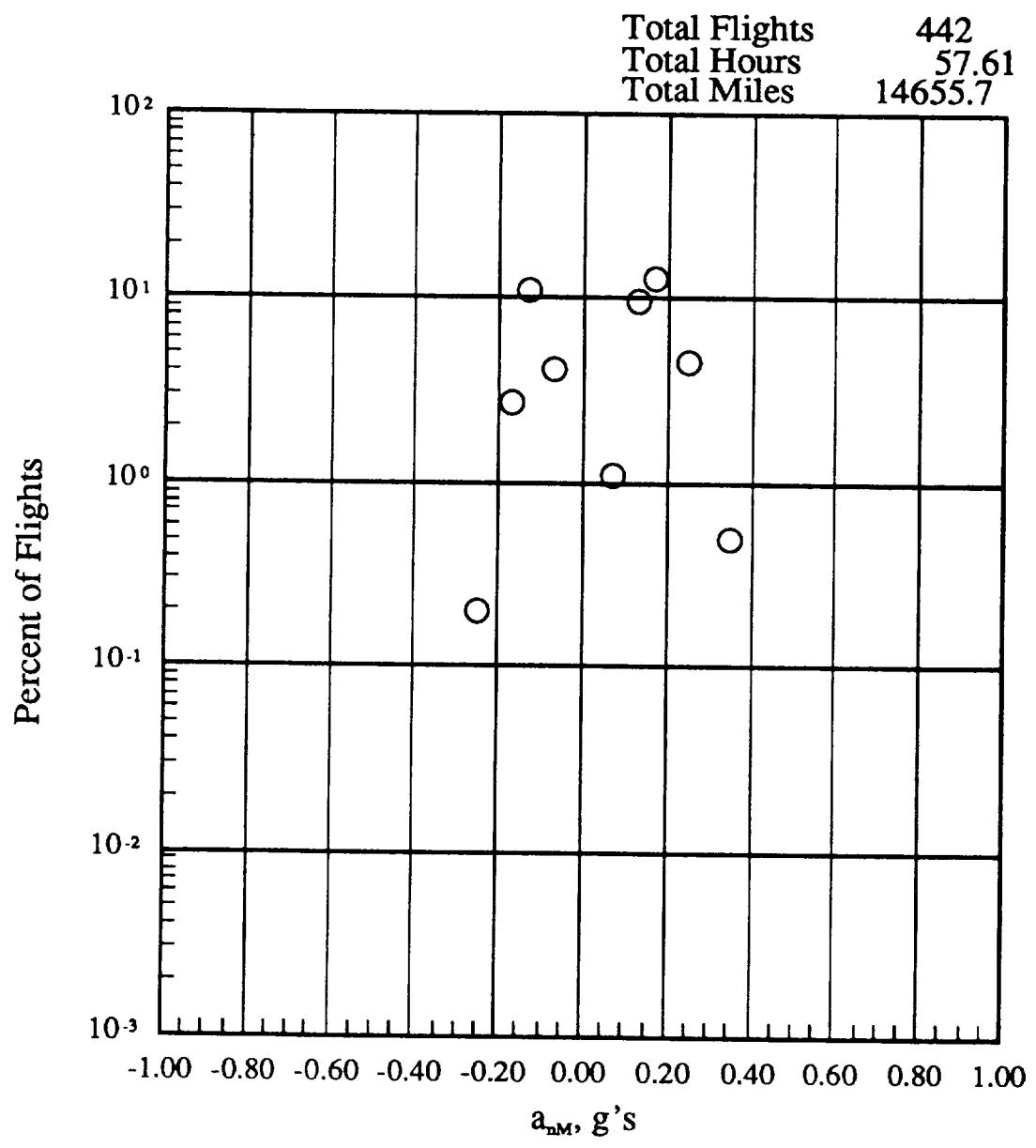
(a) Percent of flights where peak positive and negative  $a_{nM}$  per flight occurs within pressure altitude bands, any flap

Figure 17.- Peak positive and negative  $a_{nM}$  vs altitude.



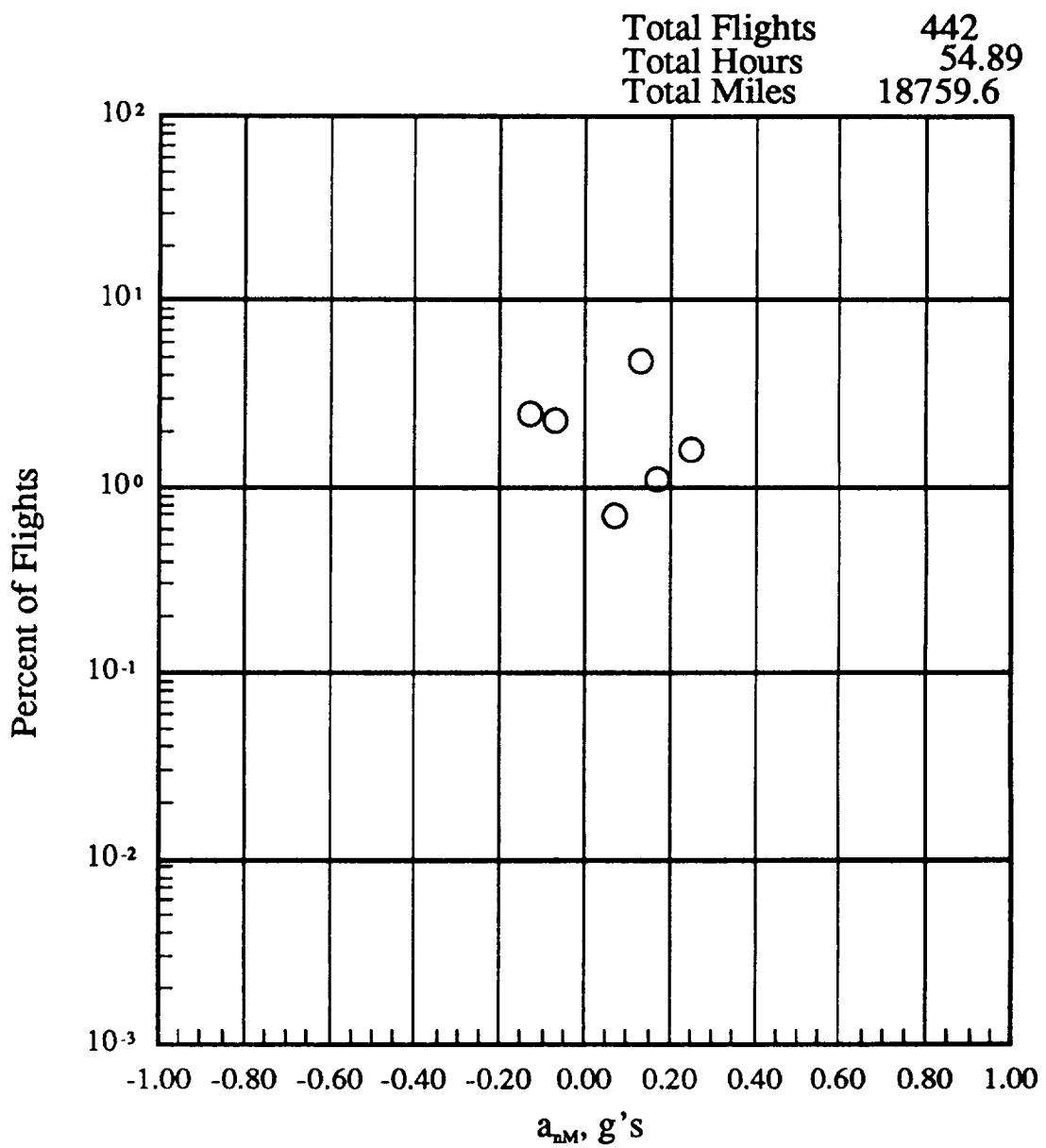
(b) -500 to 4500 feet altitude

Figure 17.- Continued.



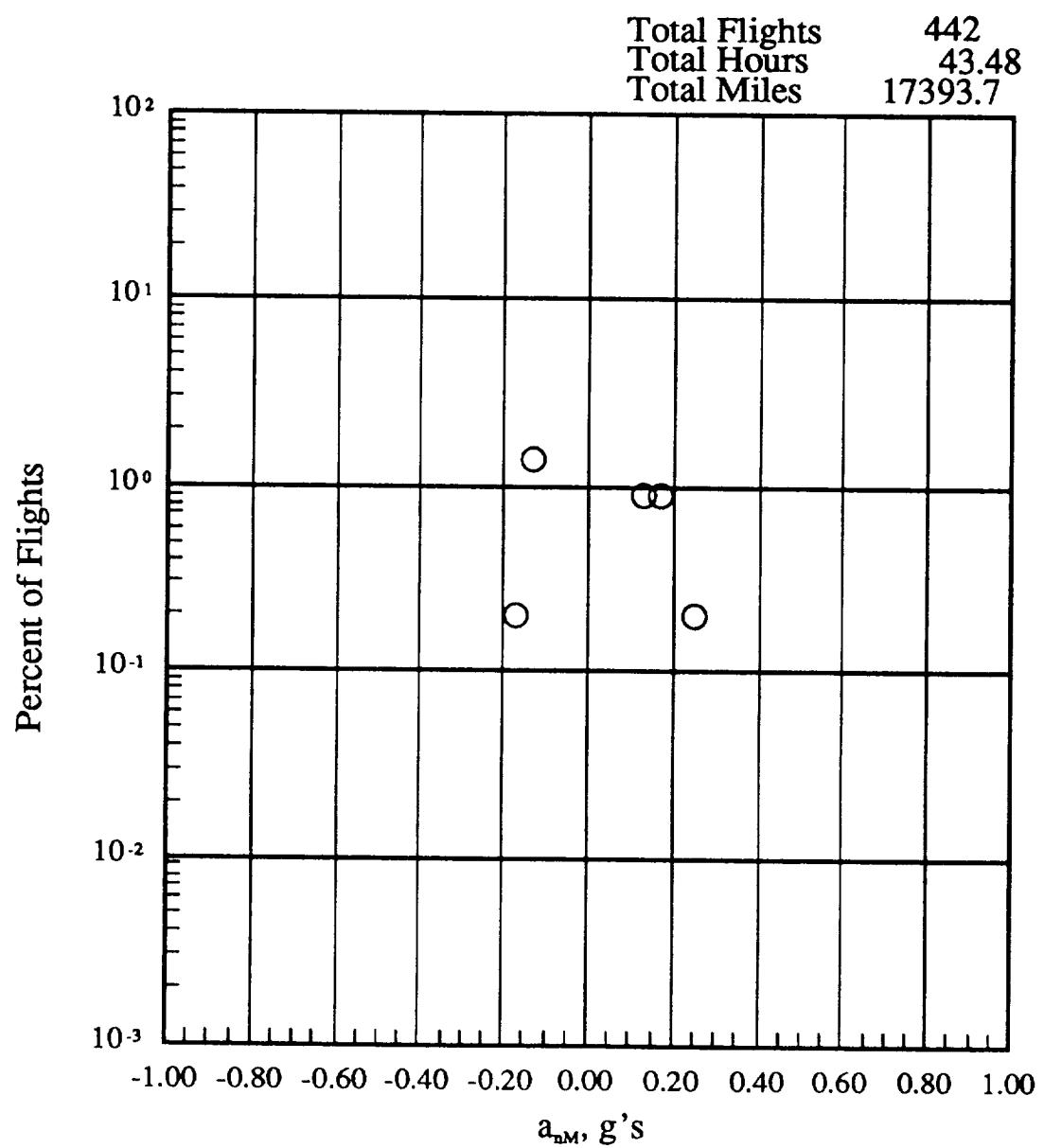
(c) 4500 to 9500 feet altitude

Figure 17.- Continued.



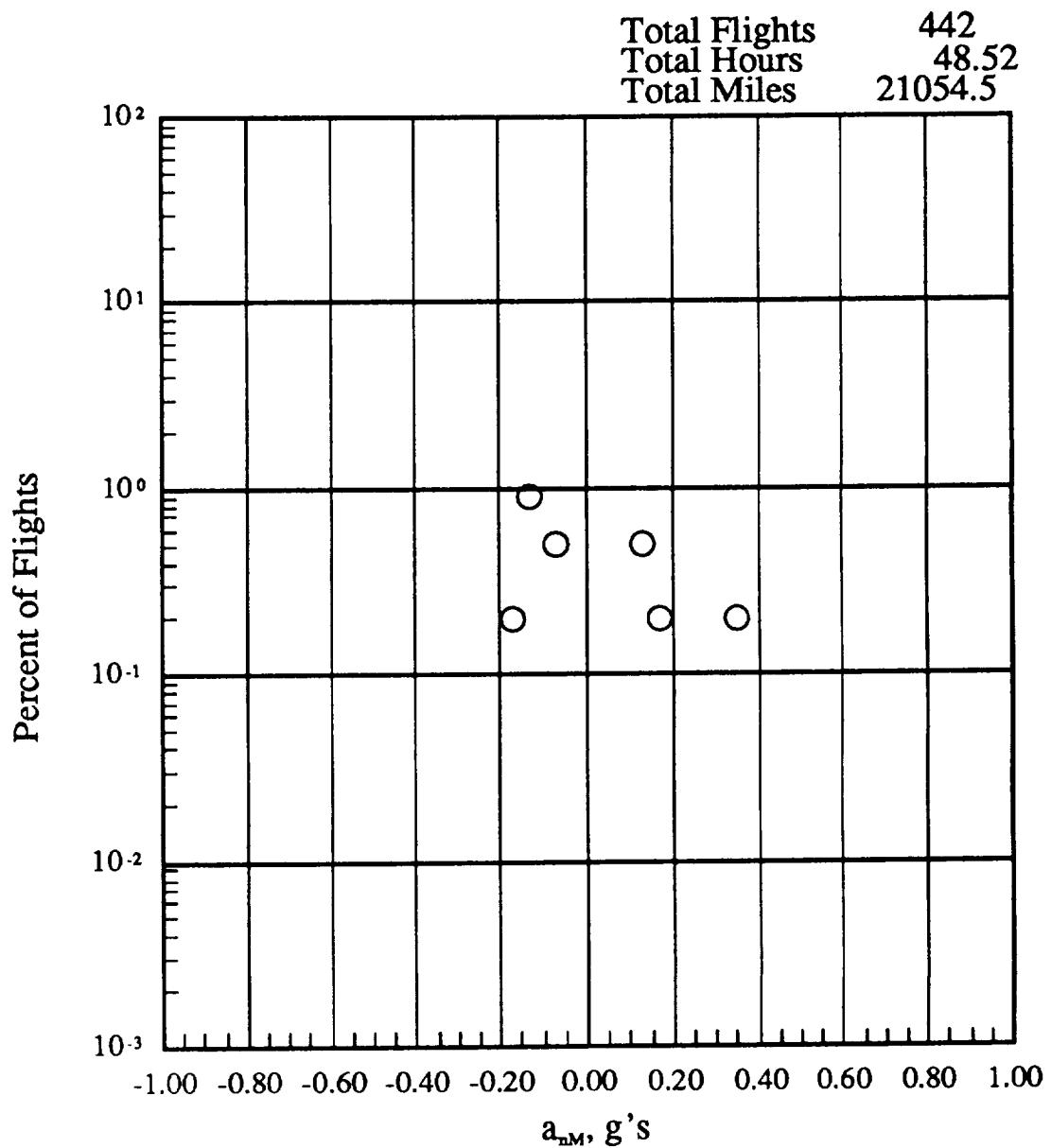
(d) 9500 to 14500 feet altitude

Figure 17.- Continued.



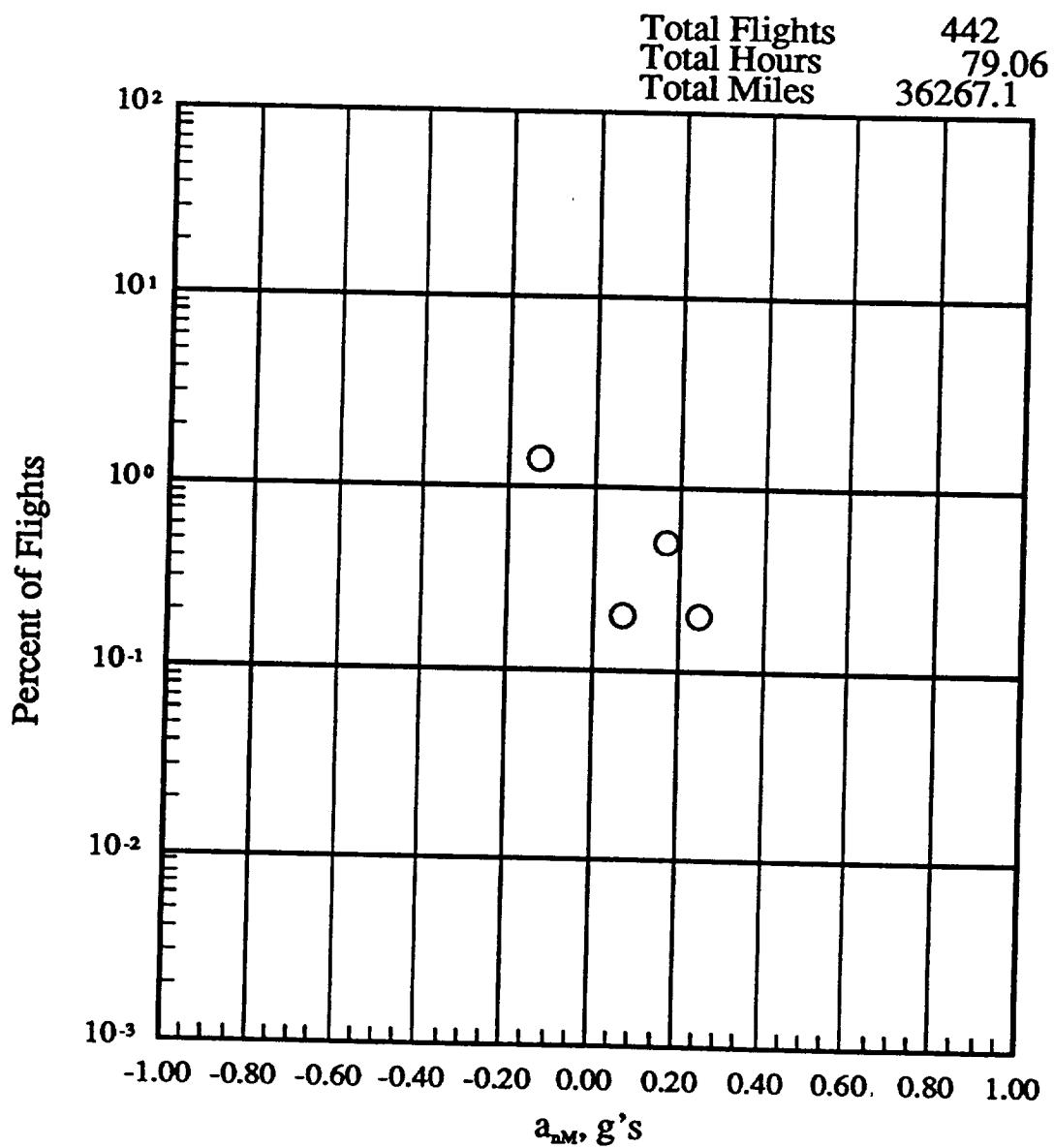
(e) 14500 to 19500 feet altitude

Figure 17.- Continued.



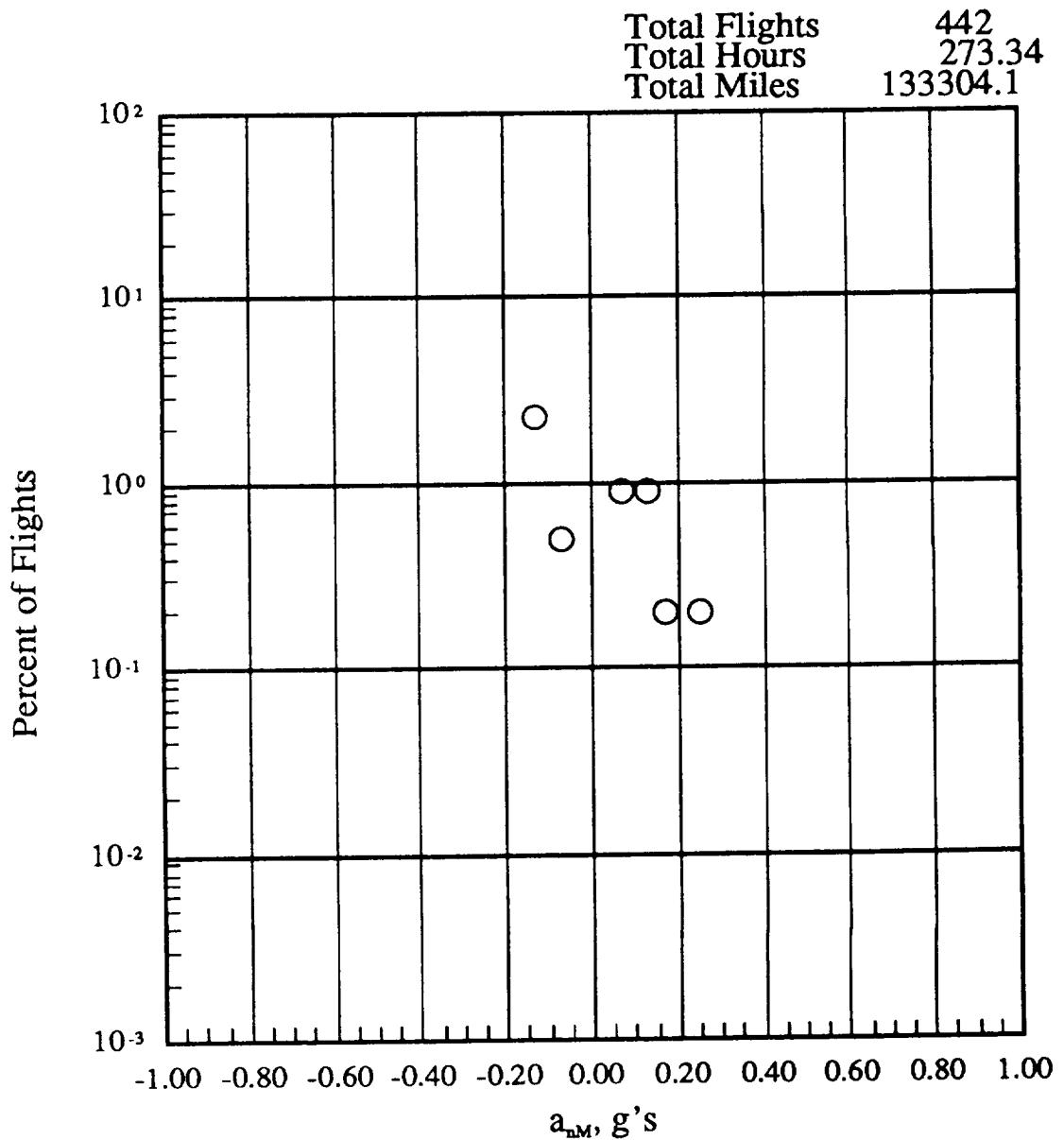
(f) 19500 to 24500 feet altitude

Figure 17.- Continued.



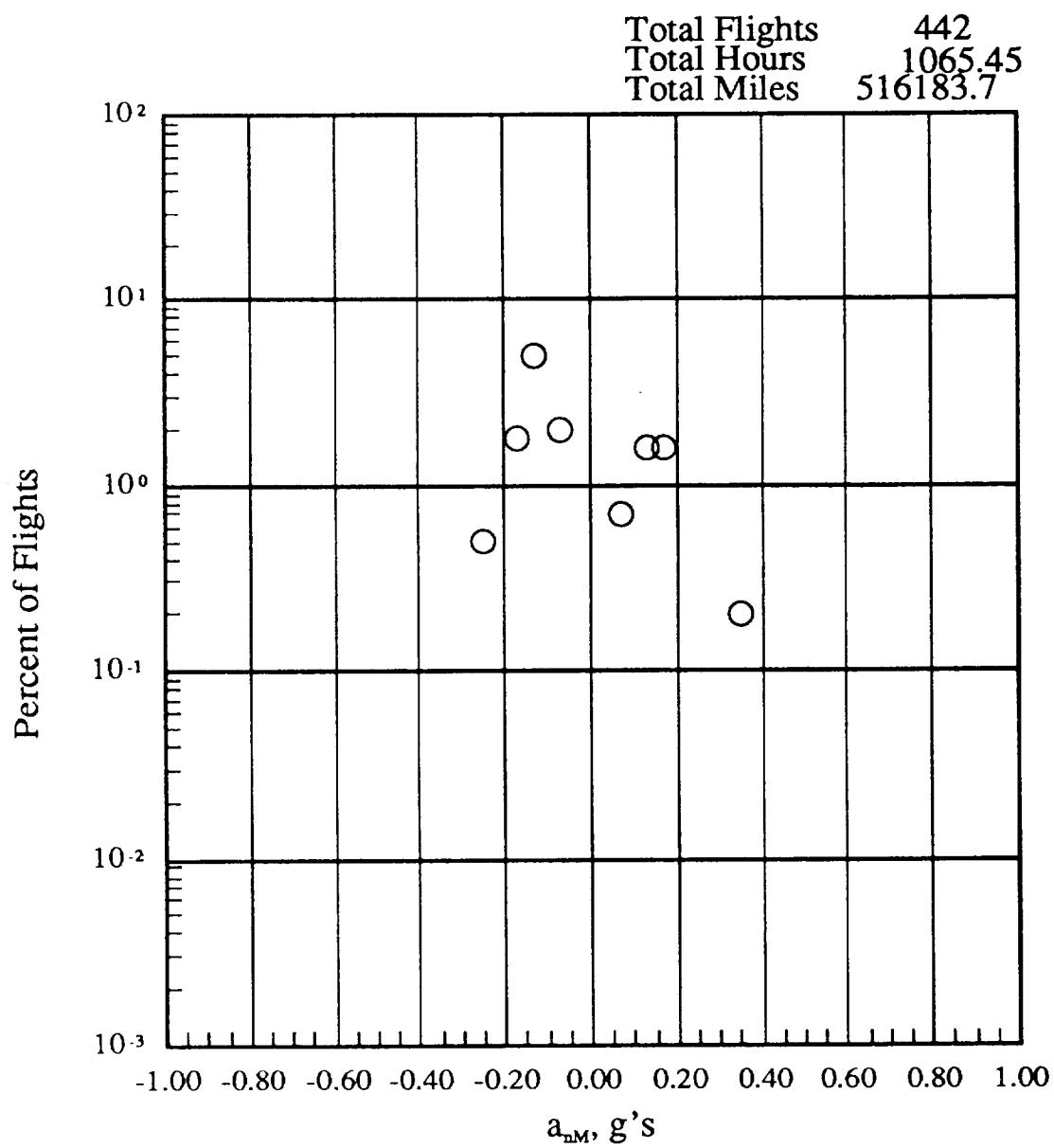
(g) 24500 to 29500 feet altitude

Figure 17.- Continued.



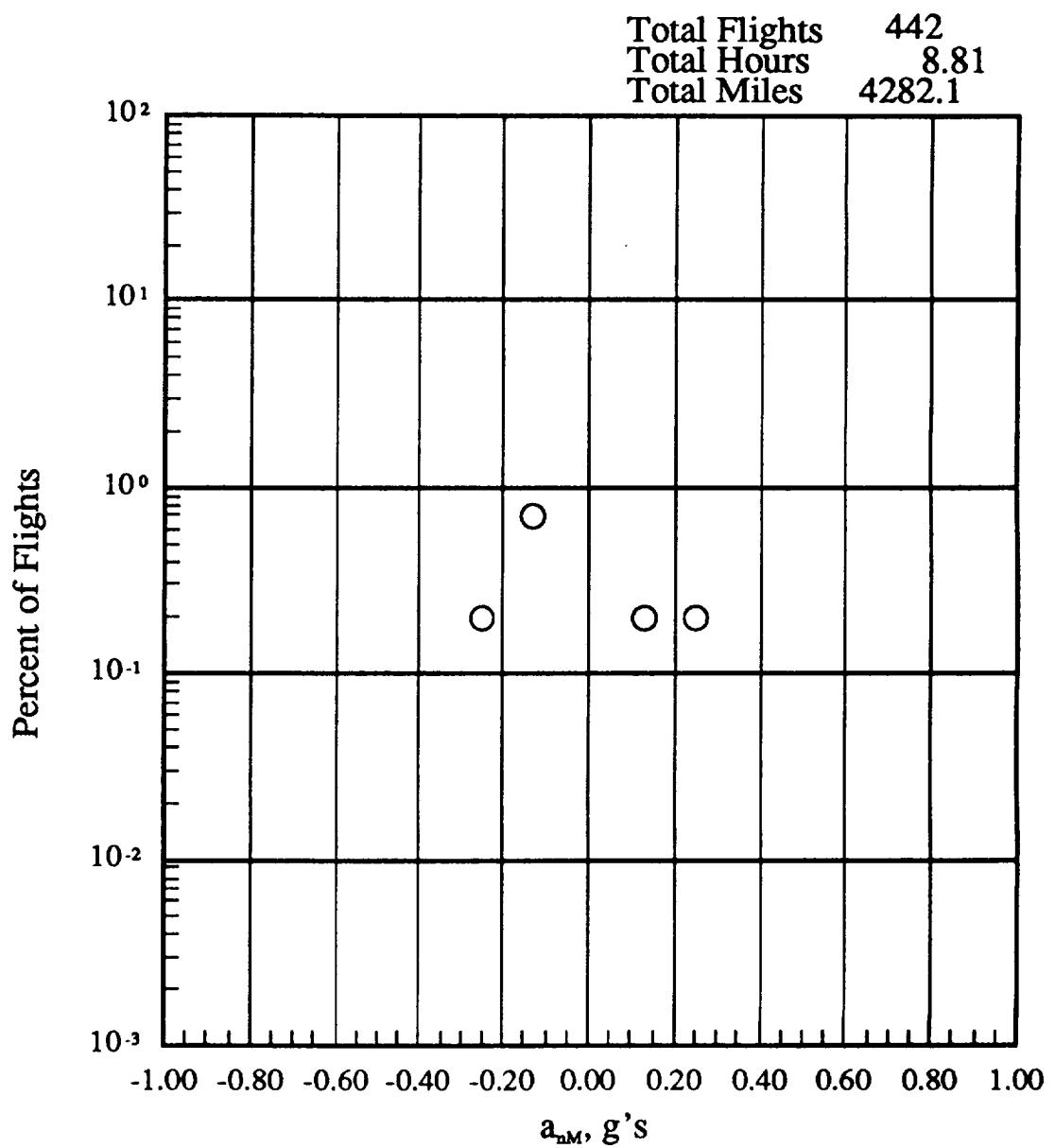
(h) 29500 to 34500 feet altitude

Figure 17.- Continued.



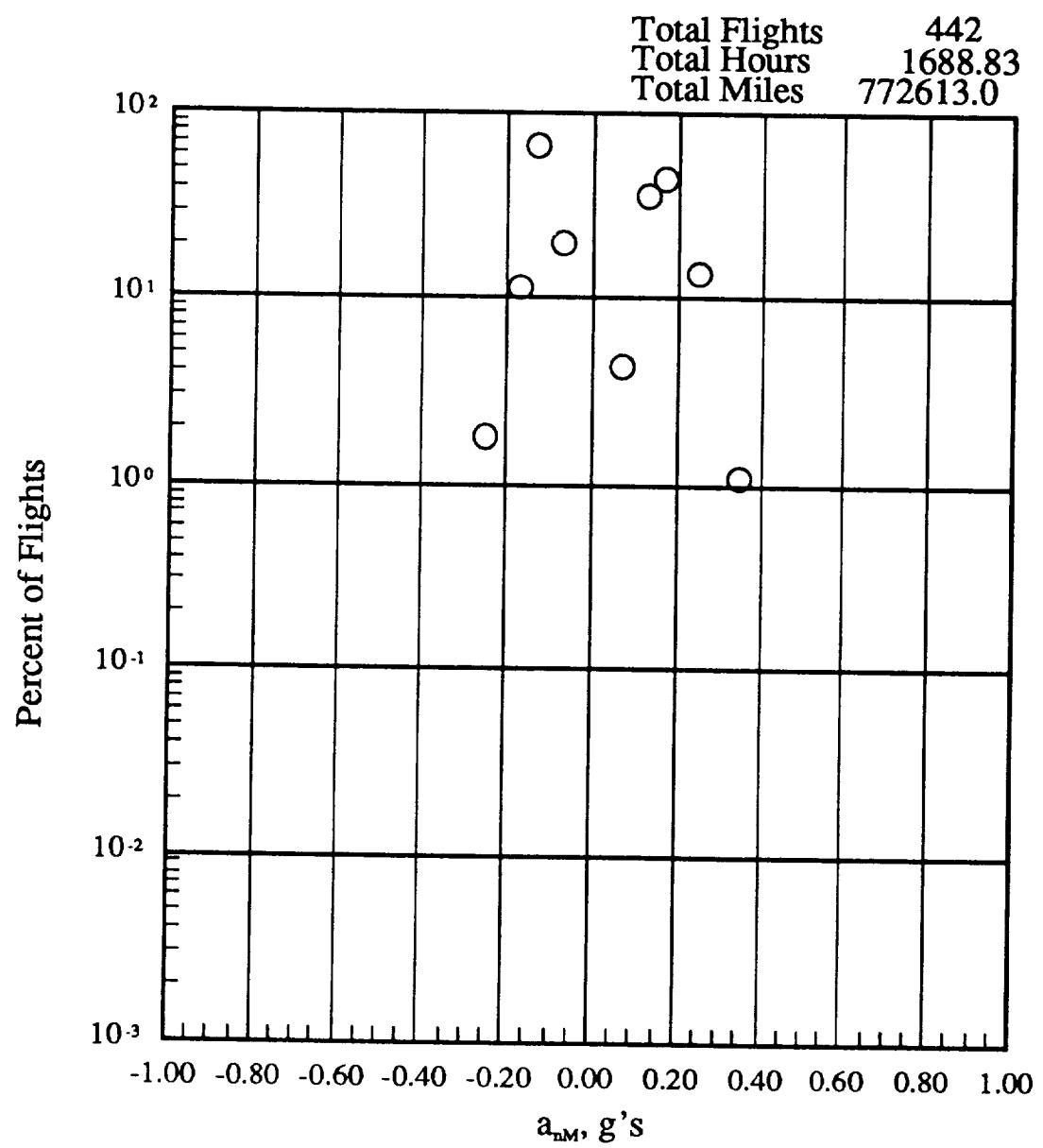
(i) 34500 to 39500 feet altitude

Figure 17.- Continued.



(j) 39500 to 44500 feet altitude

Figure 17.- Continued.



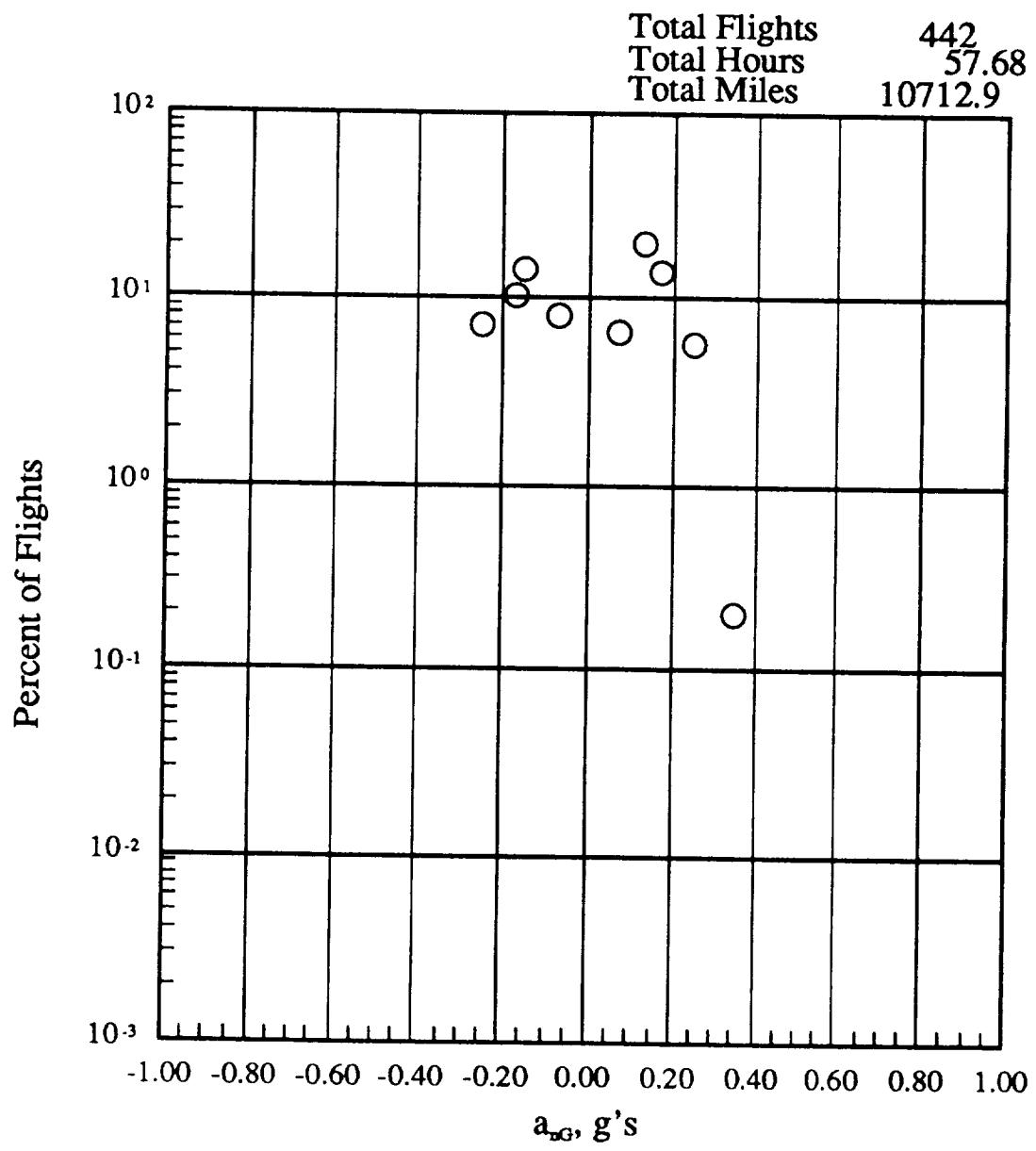
(k) -500 to 44500 feet altitude

Figure 17.- Concluded.

MAXIMUM $\Delta_{\text{nG}}$ LEVEL FOR EACH FLIGHT	FLIGHT'S FROM TO	PRESSURE ALTITUDE BANDS										TOTAL FLIGHTS
		-500 TO 4500 FT	4500 TO 9500 FT	9500 TO 14500 FT	14500 TO 19500 FT	19500 TO 24500 FT	24500 TO 29500 FT	29500 TO 34500 FT	34500 TO 39500 FT	39500 TO 44500 FT	-500 TO 44500 FT	
1.60	1.80	0	0	0	0	0	0	0	0	0	0	0
1.40	1.60	0	0	0	0	0	0	0	0	0	0	0
1.20	1.40	0	0	0	0	0	0	0	0	0	0	0
1.00	1.20	0	0	0	0	0	0	0	0	0	0	0
.80	1.00	0	0	0	0	0	0	0	0	0	0	0
.70	0.80	0	0	0	0	0	0	0	0	0	0	0
.60	0.70	0	0	0	0	0	0	0	0	0	0	0
.50	0.60	0	0	0	0	0	0	0	0	0	0	0.2
.40	0.50	0	0	0	0	0	0	0	0	0	0	0
.30	0.40	0.2	0.7	0.2	0	0	0	0.2	0.9	0.5	2.7	16.3
.20	0.30	5.7	4.3	1.8	0.7	0.2	0.5	0.5	2.7	0	0	27.4
.15	0.20	14.0	4.1	1.1	1.4	1.1	0.7	1.6	3.4	0	0	37.1
.10	0.15	20.1	5.7	3.4	0.9	0.5	0.9	1.1	4.1	0.5	0	16.1
.05	0.10	6.6	2.5	1.6	1.4	0	0.9	0.2	2.9	0	0	0
-.05	-0.10	8.1	2.0	1.1	0.2	0.2	0.9	0.9	2.9	0	0	16.5
-.10	-0.15	14.5	6.1	3.2	3.6	0.5	0.7	1.4	6.3	0.2	0	36.4
-.15	-0.20	10.4	4.5	1.6	0.7	0.9	0.2	1.6	4.3	0	0	24.2
-.20	-0.30	7.2	7.0	1.8	0.7	0	0	0.7	3.6	0.5	0	21.5
-.30	-0.40	0	0.5	0	0	0	0	0	0.5	0	0	0.9
-.40	-0.50	0	0	0	0	0	0	0	0	0	0	0
-.50	-0.60	0	0	0	0	0	0	0	0	0	0	0
-.60	-0.70	0	0	0	0	0	0	0	0	0	0	0
-.70	-0.80	0	0	0	0	0	0	0	0	0	0	0
-.80	-1.00	0	0	0	0	0	0	0	0	0	0	0
-.90	-1.20	0	0	0	0	0	0	0	0	0	0	0
-.10	-1.40	0	0	0	0	0	0	0	0	0	0	0
-.140	-1.60	0	0	0	0	0	0	0	0	0	0	0
-.160	-1.80	0	0	0	0	0	0	0	0	0	0	0
57.68	57.61	54.89	43.48	48.52	79.06	273.34	1065.45	8.81	1688.83			
10712.91	14655.73	18759.60	17393.17	21054.53	36267.13	133304.11	516183.66	4282.14	772612.98			

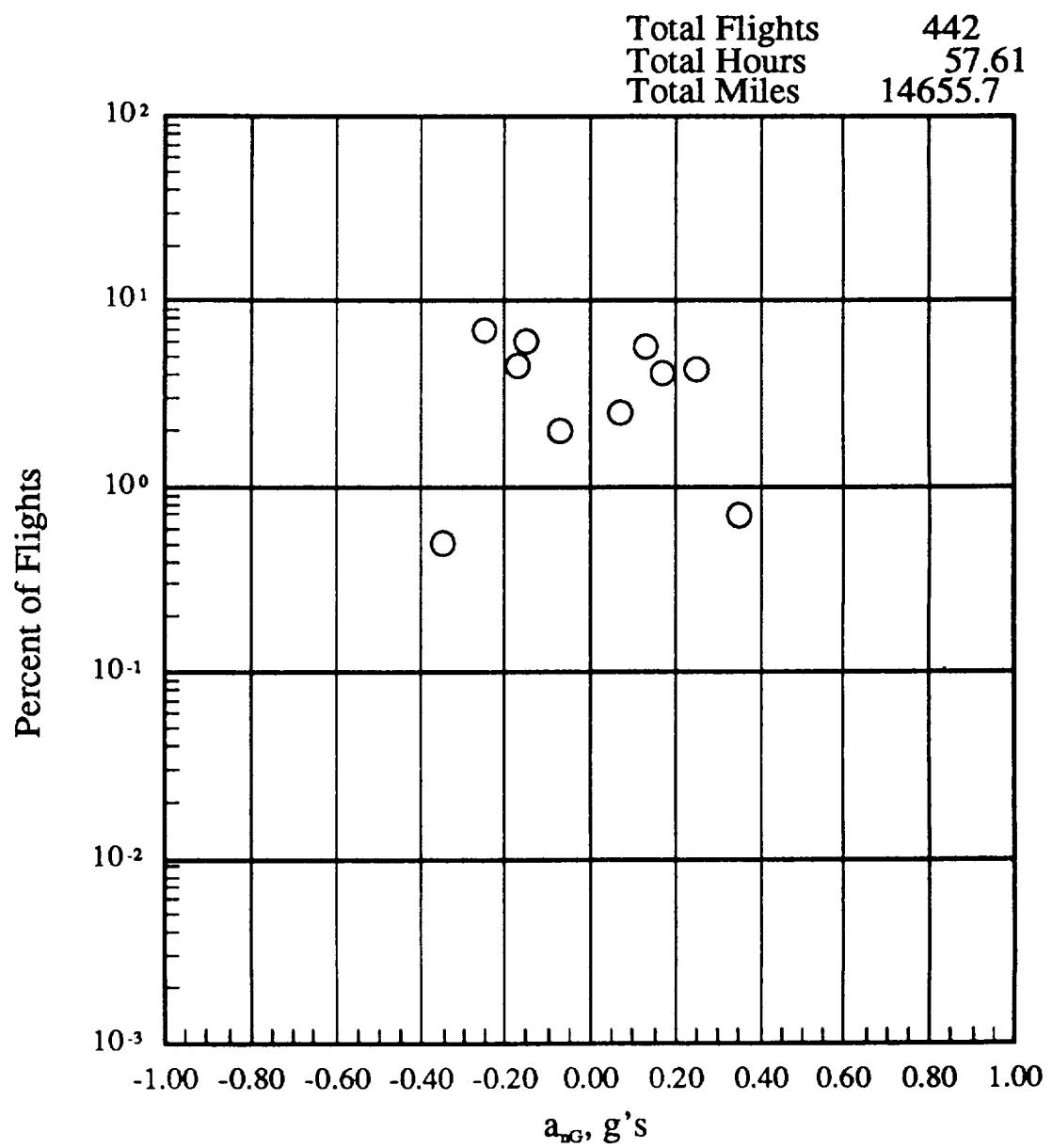
(a) Percent of flights where peak positive and negative  $a_{nG}$  per flight occurs within pressure altitude bands, any flap

Figure 18.- Peak positive and negative  $a_{\text{G}}$  vs altitude.



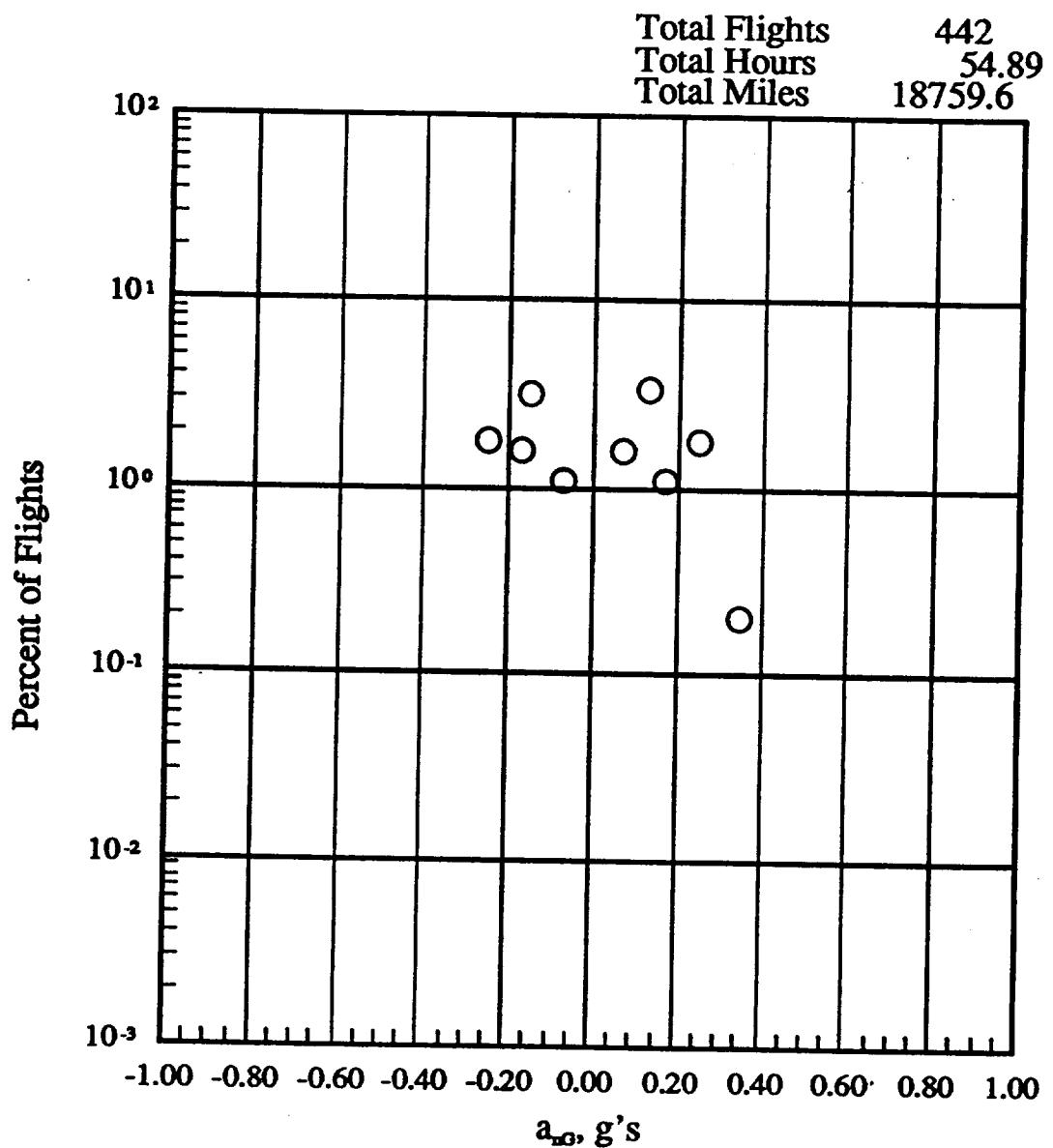
(b) -500 to 4500 feet altitude

Figure 18.- Continued.



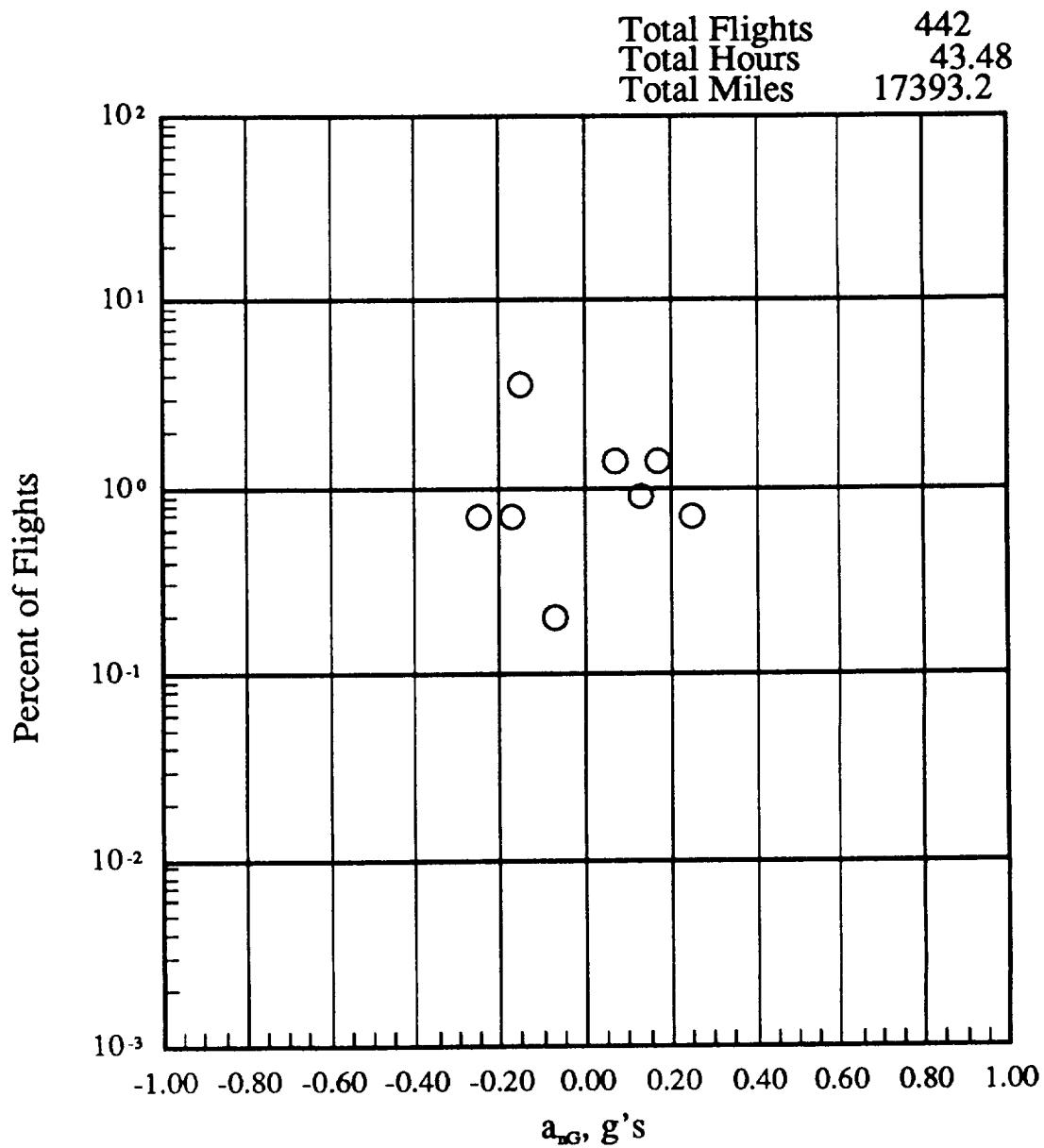
(c) 4500 to 9500 feet altitude

Figure 18.- Continued.



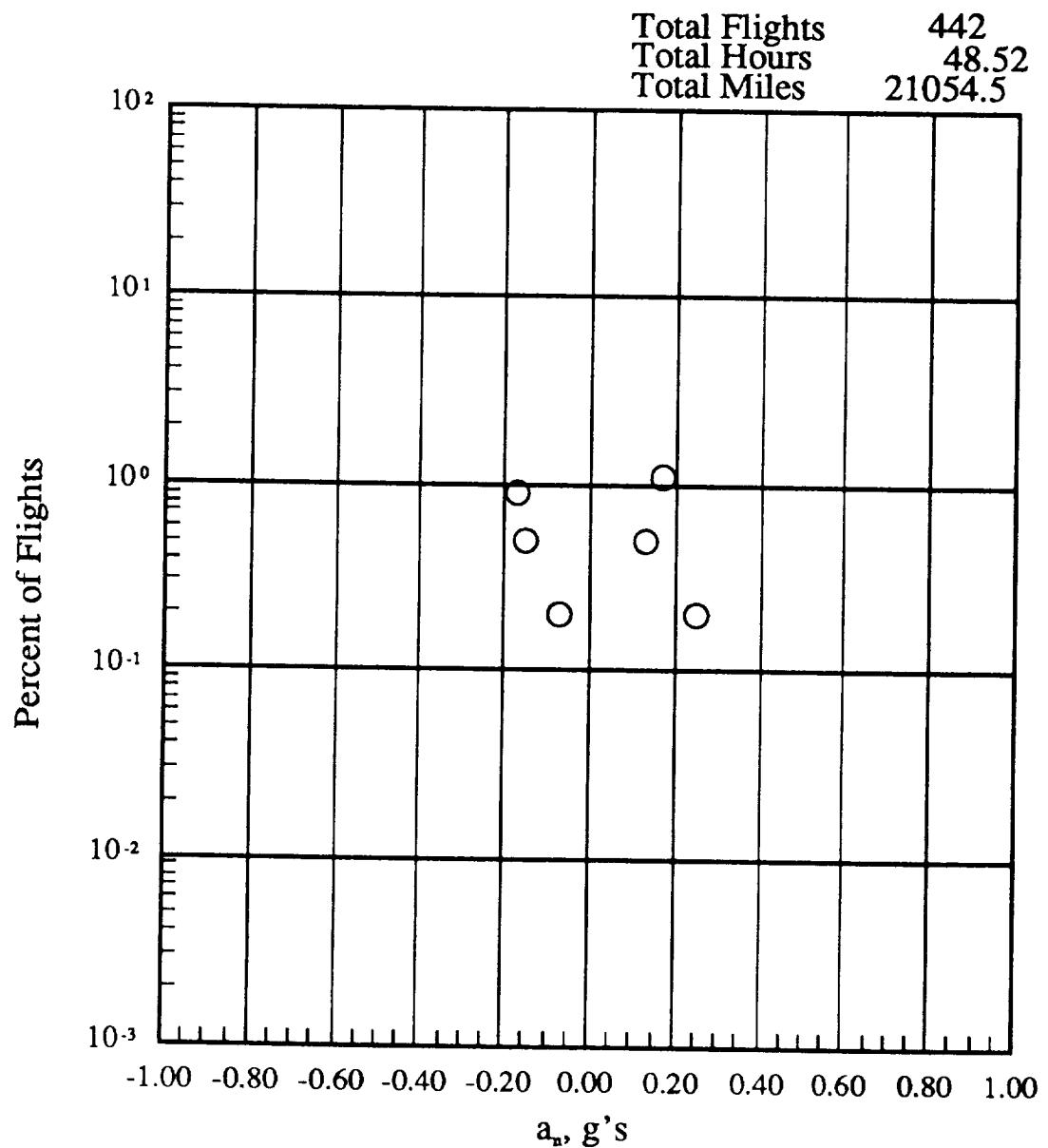
(d) 9500 to 14500 feet altitude

Figure 18.- Continued.



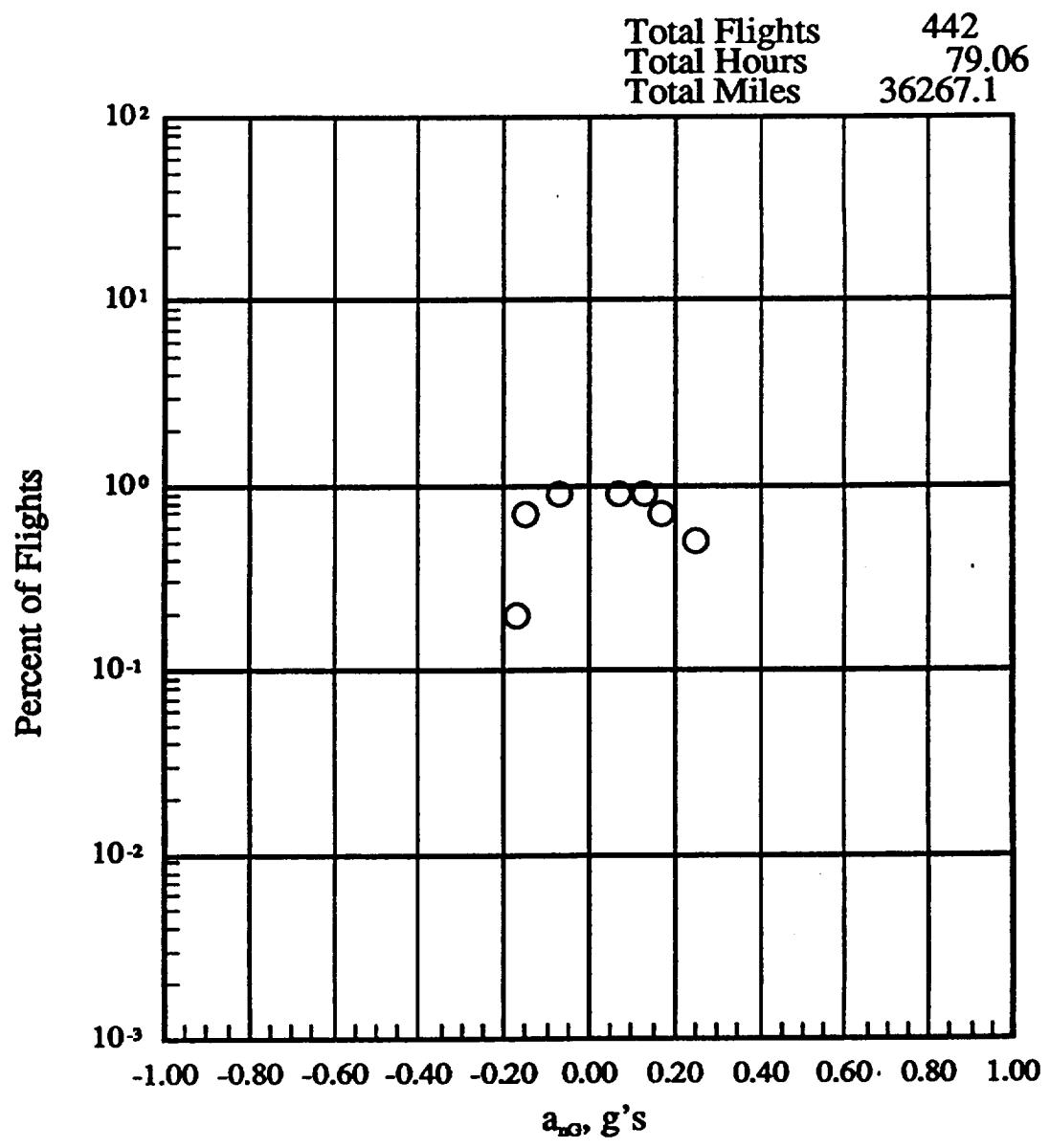
(e) 14500 to 19500 feet altitude

Figure 18.- Continued.



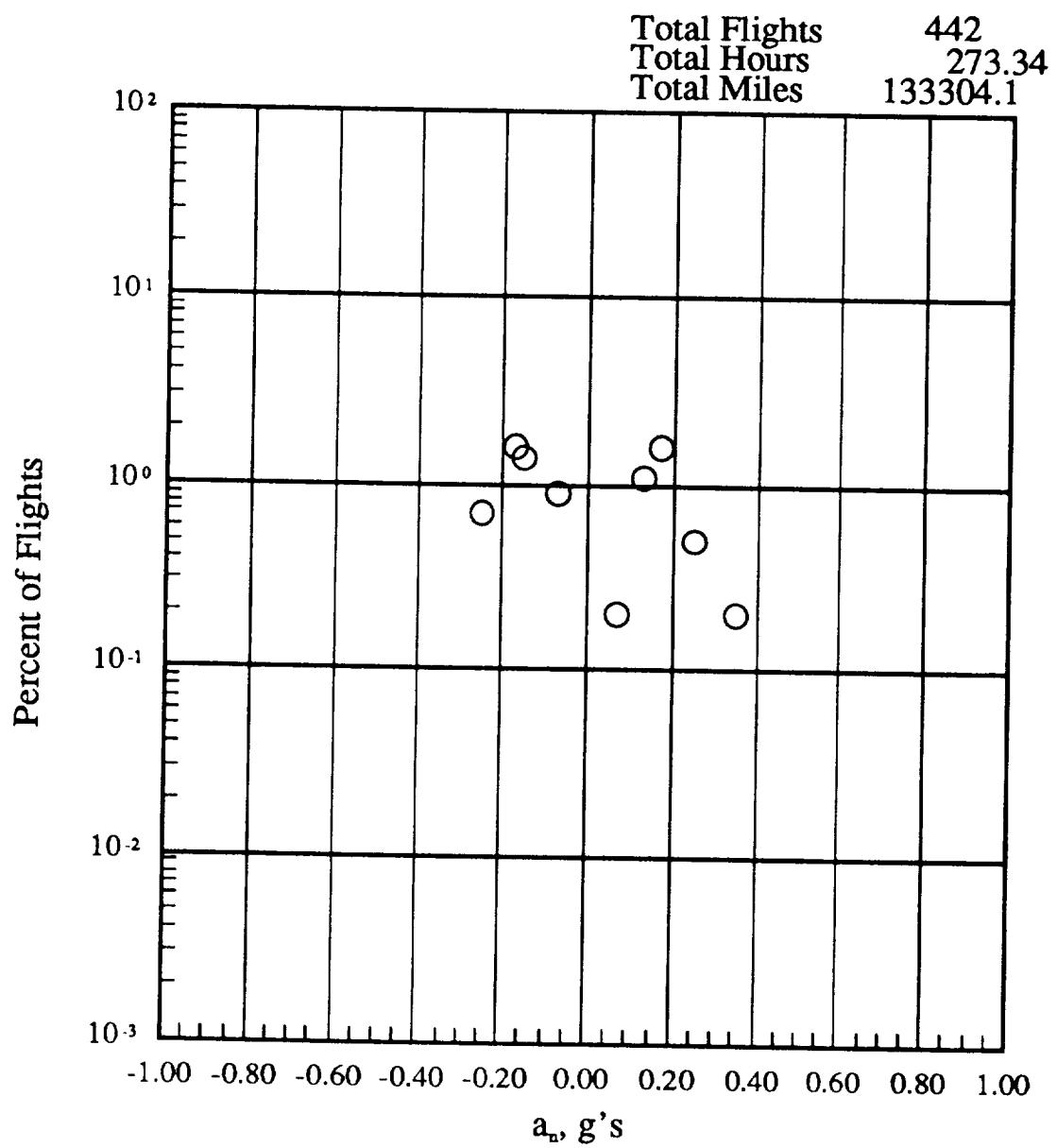
(f) 19500 to 24500 feet altitude

Figure 18.- Continued.



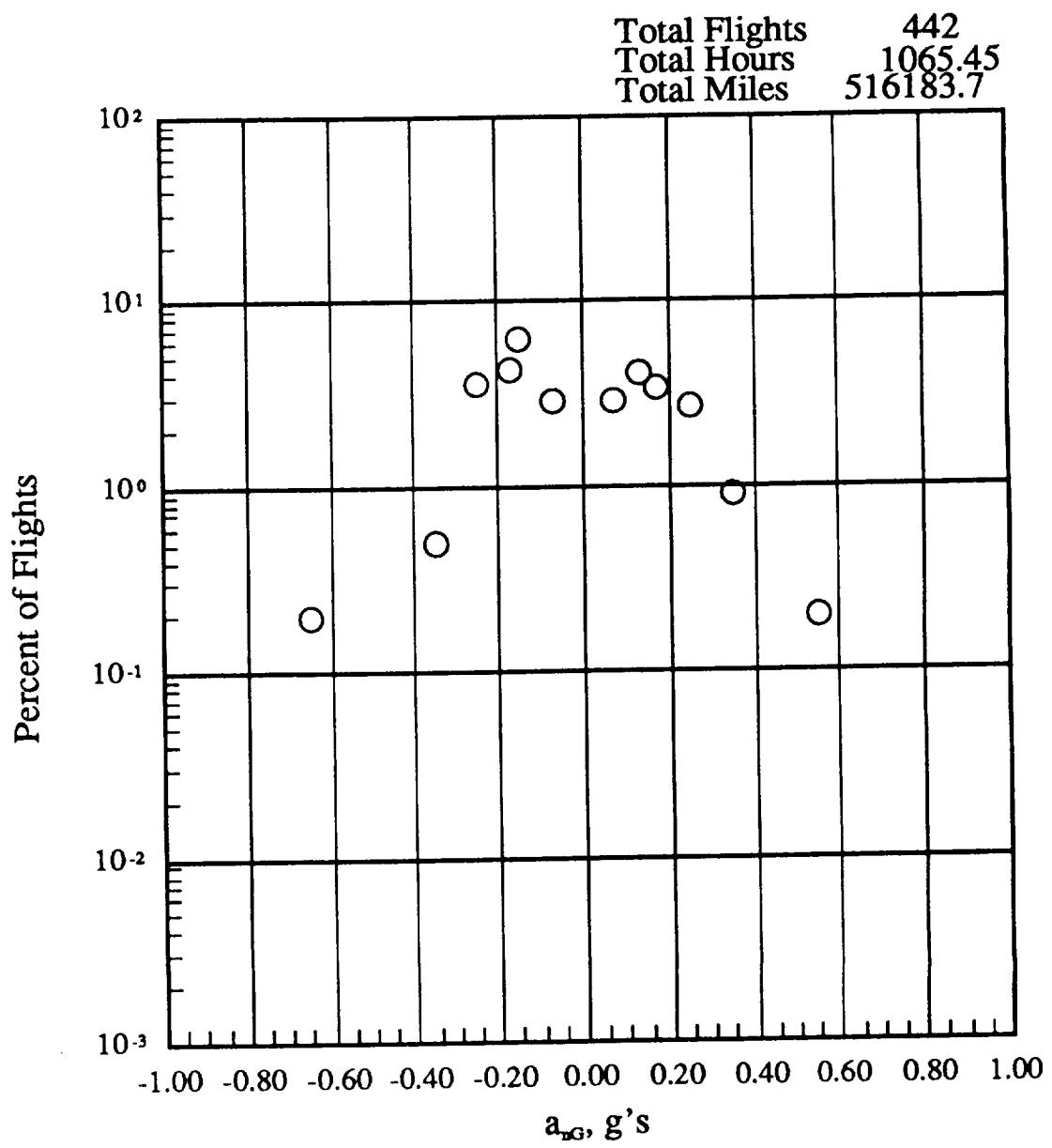
(g) 24500 to 29500 feet altitude

Figure 18.- Continued.



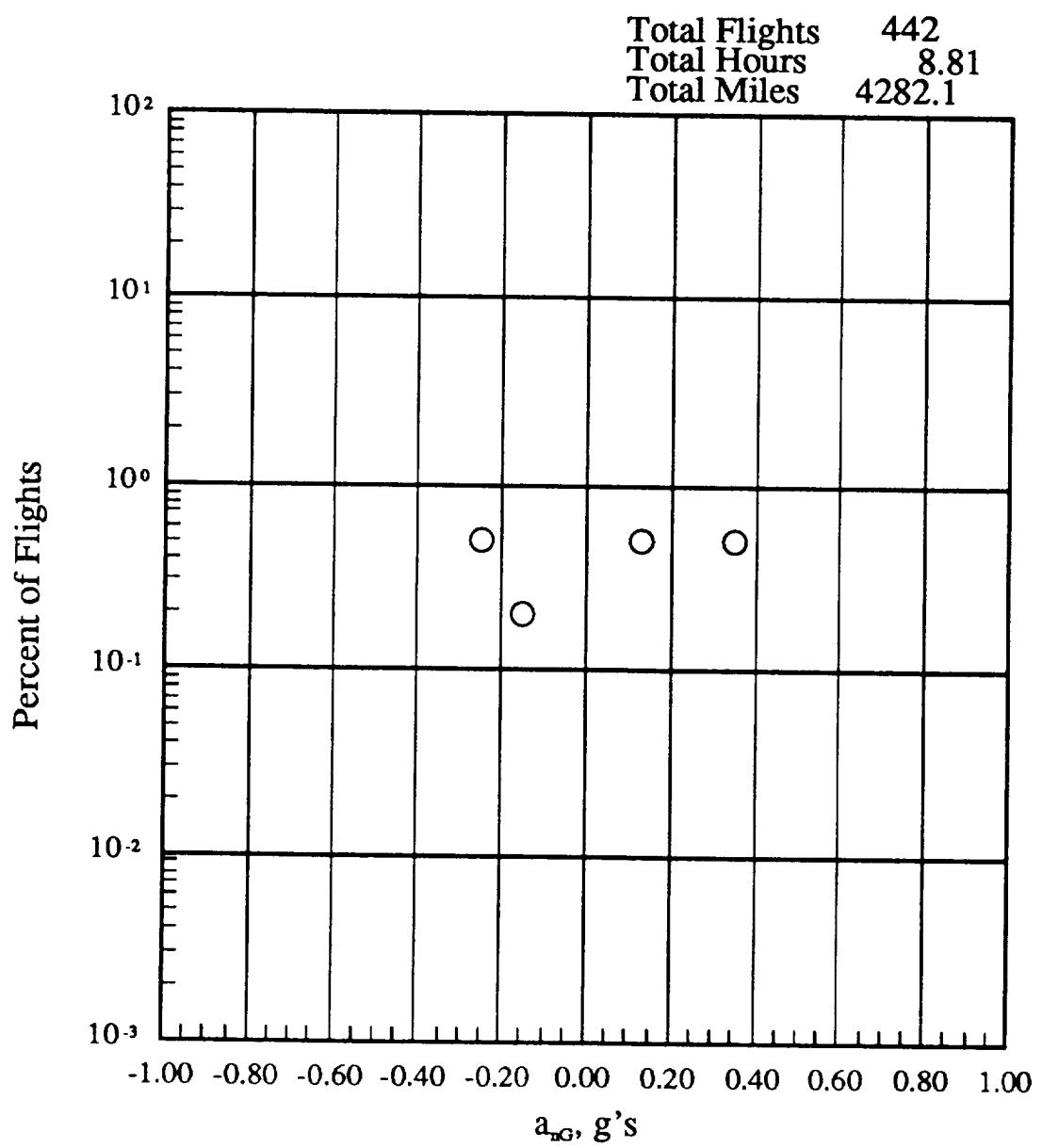
(h) 29500 to 34500 feet altitude

Figure 18.- Continued.



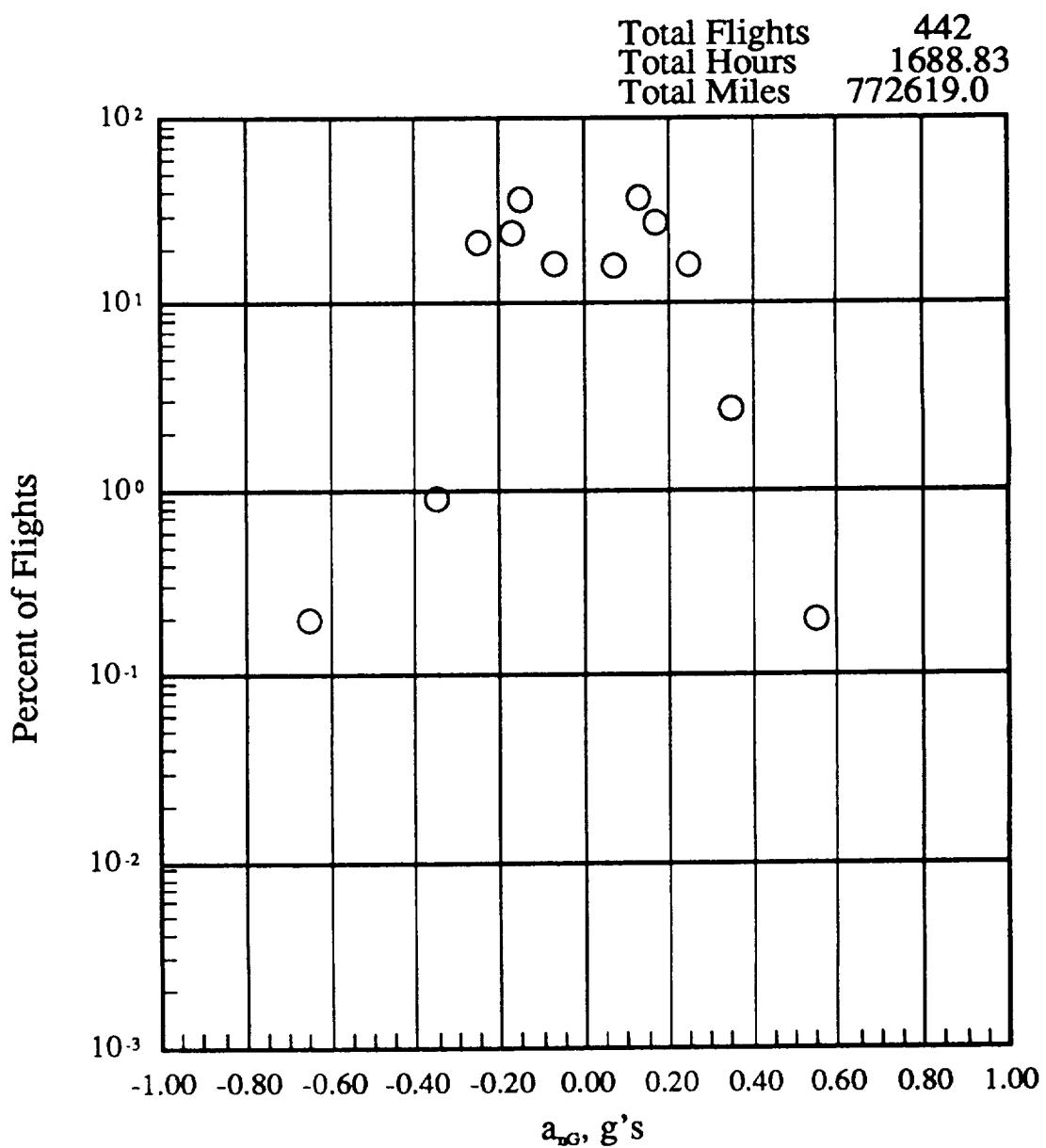
(i) 34500 to 39500 feet altitude

Figure 18.- Continued.



(j) 39500 to 44500 feet altitude

Figure 18.- Continued.



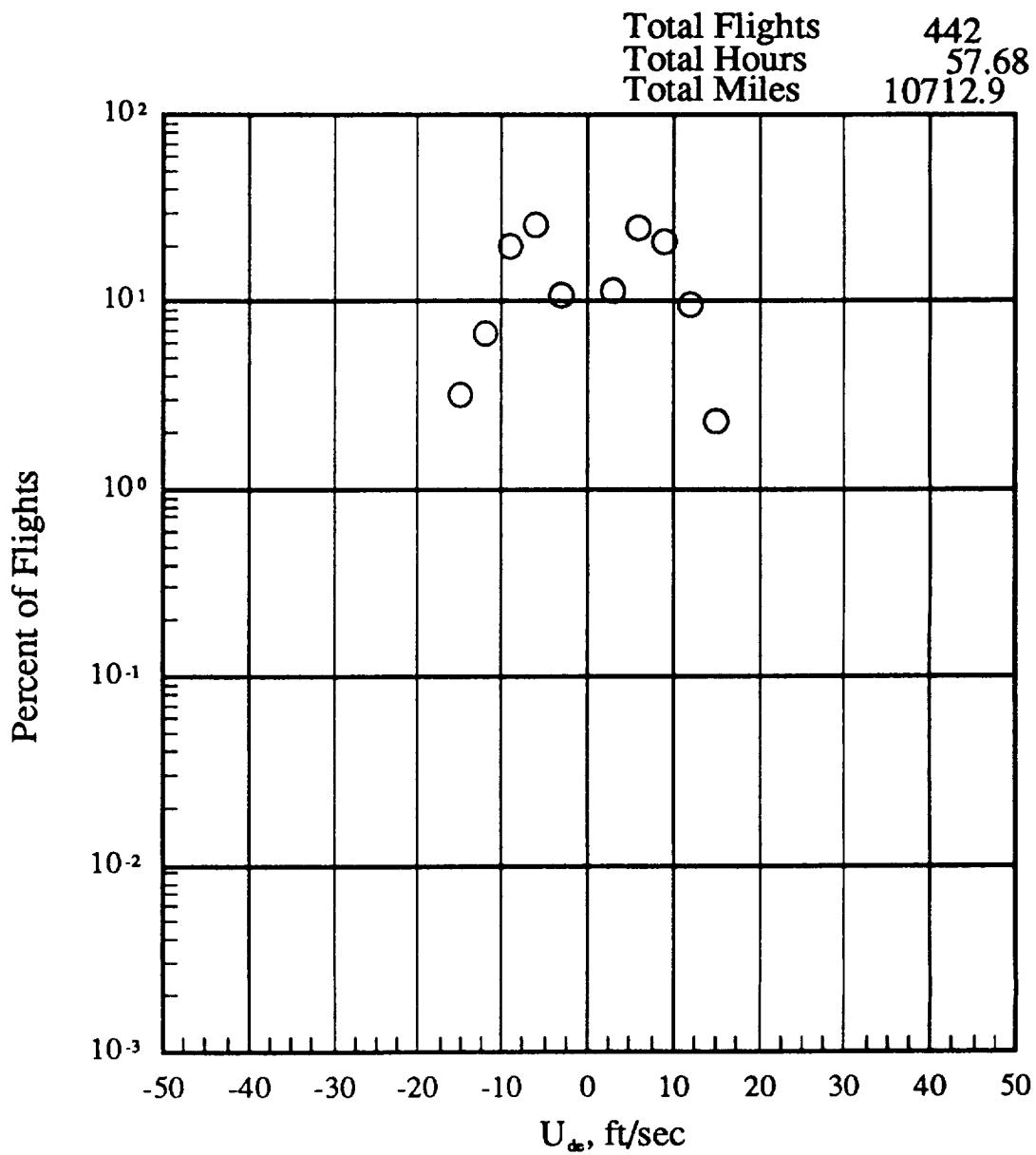
(k) -500 to 44500 feet altitude

Figure 18.- Concluded.

MAXIMUM $U_{de}$ LEVEL FT/SEC	FOR EACH FLIGHT										TOTAL FLIGHTS	
	-500 TO 4500 FT	4500 TO 9500 FT	9500 TO 14500 FT	14500 TO 19500 FT	19500 TO 24500 FT	24500 TO 29500 FT	29500 TO 34500 FT	34500 TO 39500 FT	39500 TO 44500 FT	-500 TO 44500 FT	44500 FT	
100	0	0	0	0	0	0	0	0	0	0	0	0
90	0	0	0	0	0	0	0	0	0	0	0	0
80	0	0	0	0	0	0	0	0	0	0	0	0
70	0	0	0	0	0	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0.2
15	2.3	0.9	0	0	0	0	0	0	0.2	0	0	0.2
12	9.7	2.3	0.5	0	0	0.2	0	0	0.2	0	0	0.5
9	20.8	4.5	0.7	0.5	0	0	0	0.2	0.2	0	0	0.5
6	24.7	3.4	1.8	0.5	0.5	0	0	1.1	2.0	0	0	28.7
3	11.5	2.0	1.4	0.2	0.2	0.5	0.2	0.2	0.2	0	0	33.9
-3	10.9	1.8	2.0	0.5	0.5	0.2	0	0	0	0	0	18.8
-6	25.6	4.5	0.9	0.5	0.5	0.5	0	0	0	0	0	17.2
-9	19.7	5.0	1.1	0.2	0	0	0	0.5	0	0	0	36.7
-12	6.8	3.6	0.2	0	0	0	0	0	0	0	0	29.2
-15	3.2	1.4	0	0	0	0	0	0	0	0	0	10.9
-20	0	0.2	0	0	0	0	0	0	0	0	0	4.8
-30	0	0	0	0	0	0	0	0	0	0	0	0.5
-40	0	0	0	0	0	0	0	0	0	0	0	0
-50	0	0	0	0	0	0	0	0	0	0	0	0
-60	0	0	0	0	0	0	0	0	0	0	0	0
-70	0	0	0	0	0	0	0	0	0	0	0	0
-80	0	0	0	0	0	0	0	0	0	0	0	0
-90	0	0	0	0	0	0	0	0	0	0	0	0
-100	0	0	0	0	0	0	0	0	0	0	0	0
FLIGHT HOURS @ ALT	57.68	57.61	54.39	43.48	48.52	79.06	273.34	1065.45	8.81	1688.83		
FLIGHT MILES @ ALT	10712.91	14655.73	18759.60	17393.17	21054.53	36267.13	133304.11	516183.66	4282.14	772612.98		
												442

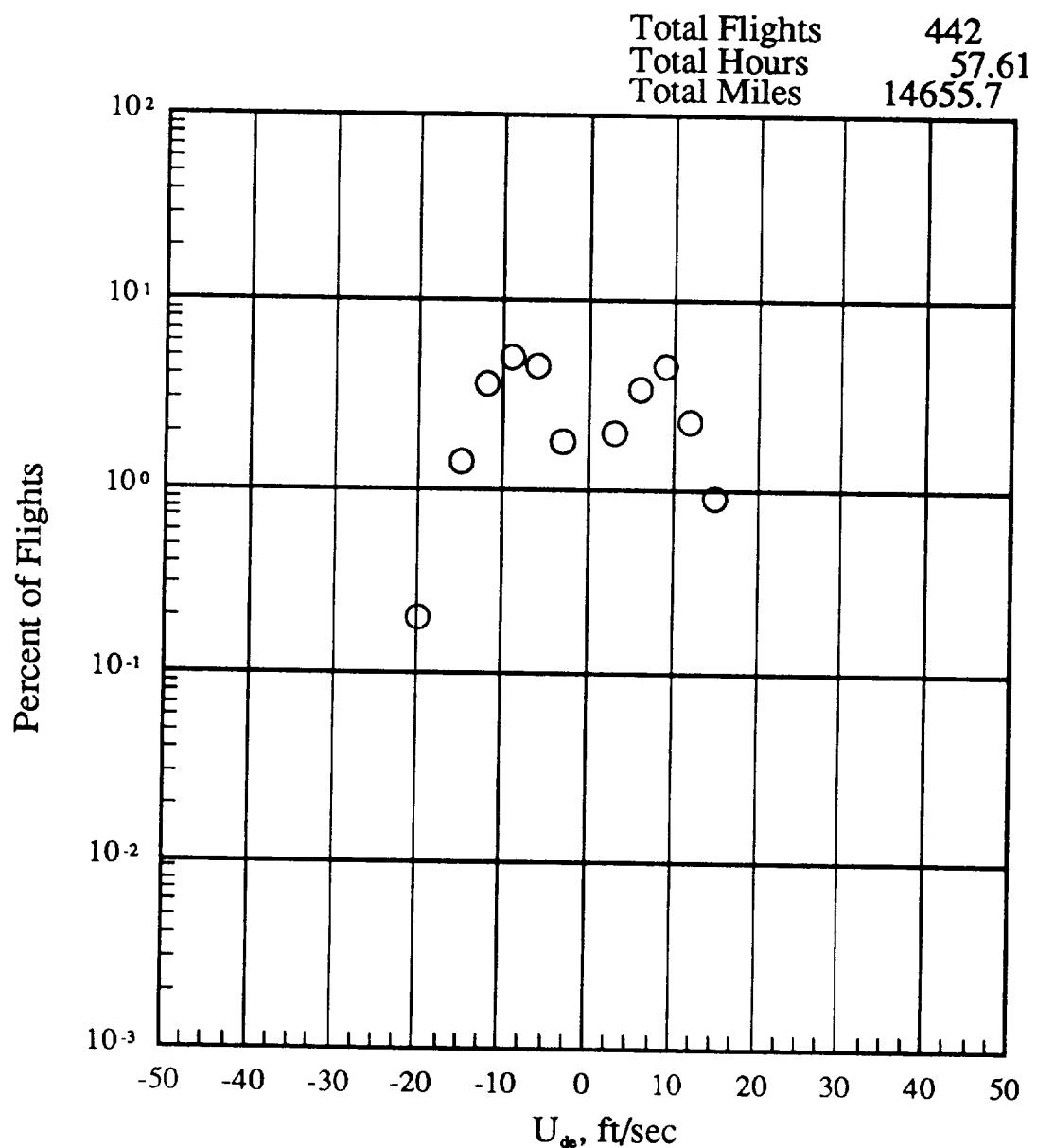
(a) Percent of flights where peak positive and negative  $U_{de}$  per flight occurs within pressure altitude bands, any flap

Figure 19.- Peak positive and negative  $U_{de}$  vs altitude.



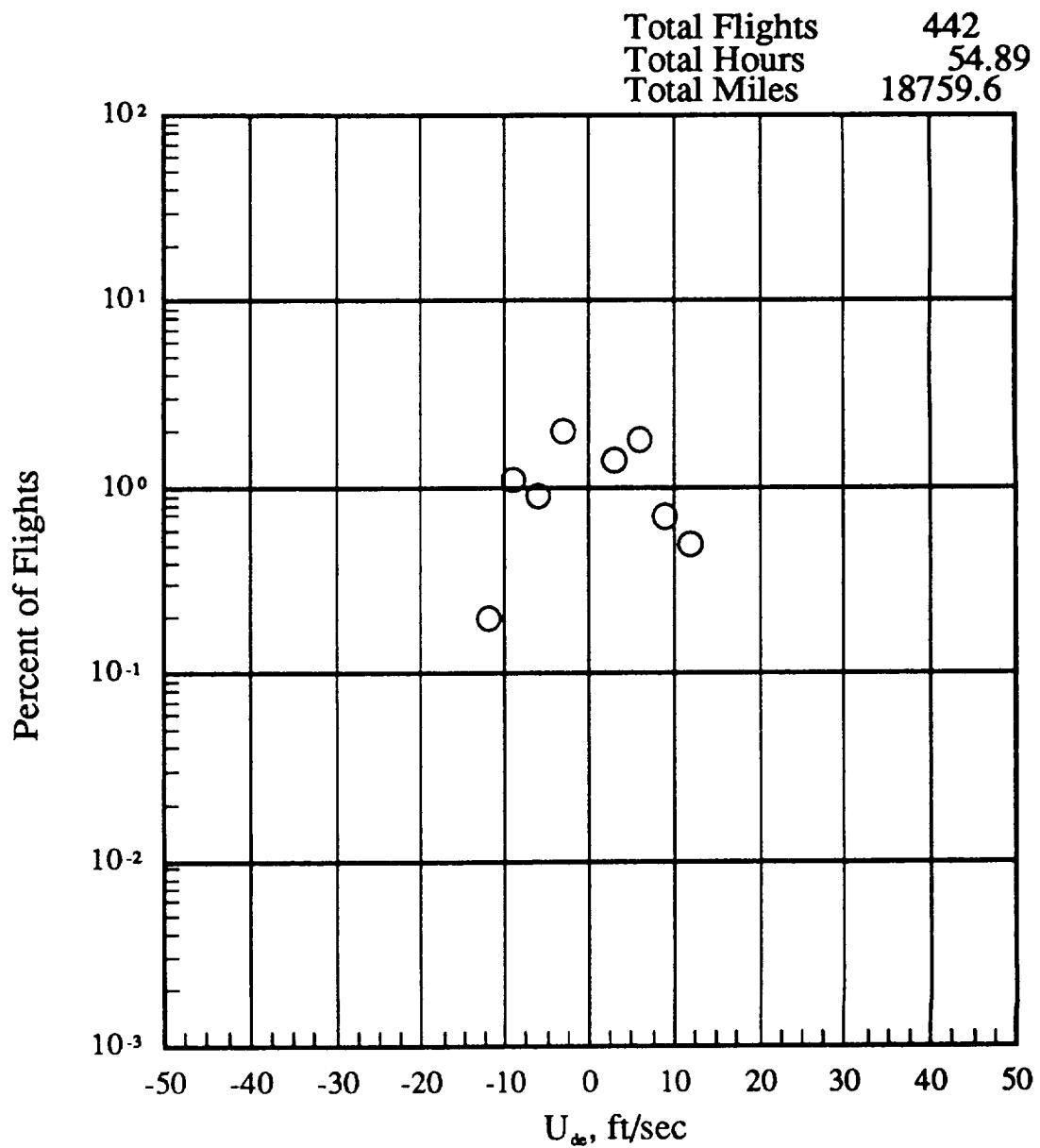
(b) -500 to 4500 feet altitude

Figure 19.- Continued.



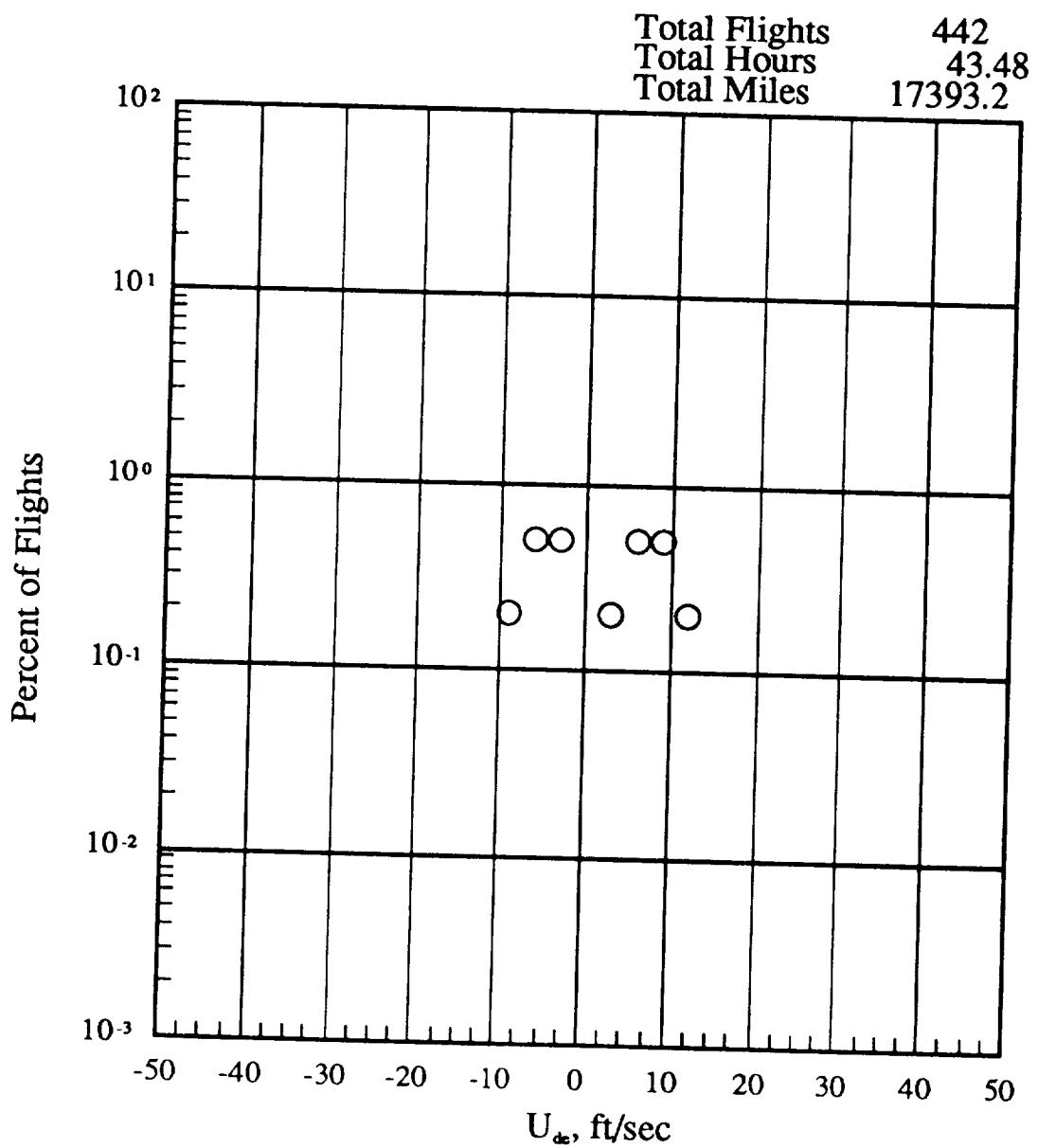
(c) 4500 to 9500 feet altitude

Figure 19.- Continued.



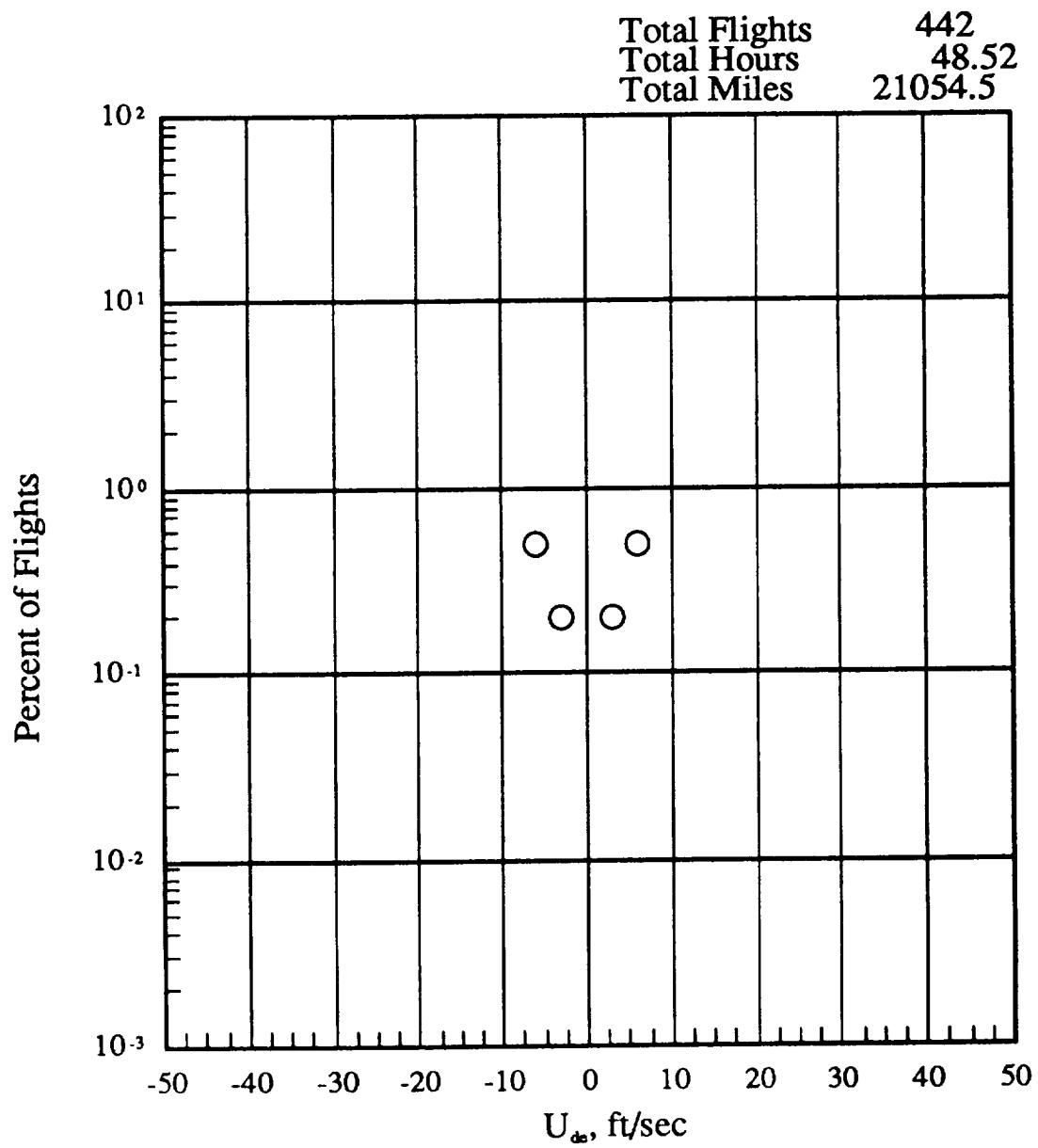
(d) 9500 to 14500 feet altitude

Figure 19.- Continued.



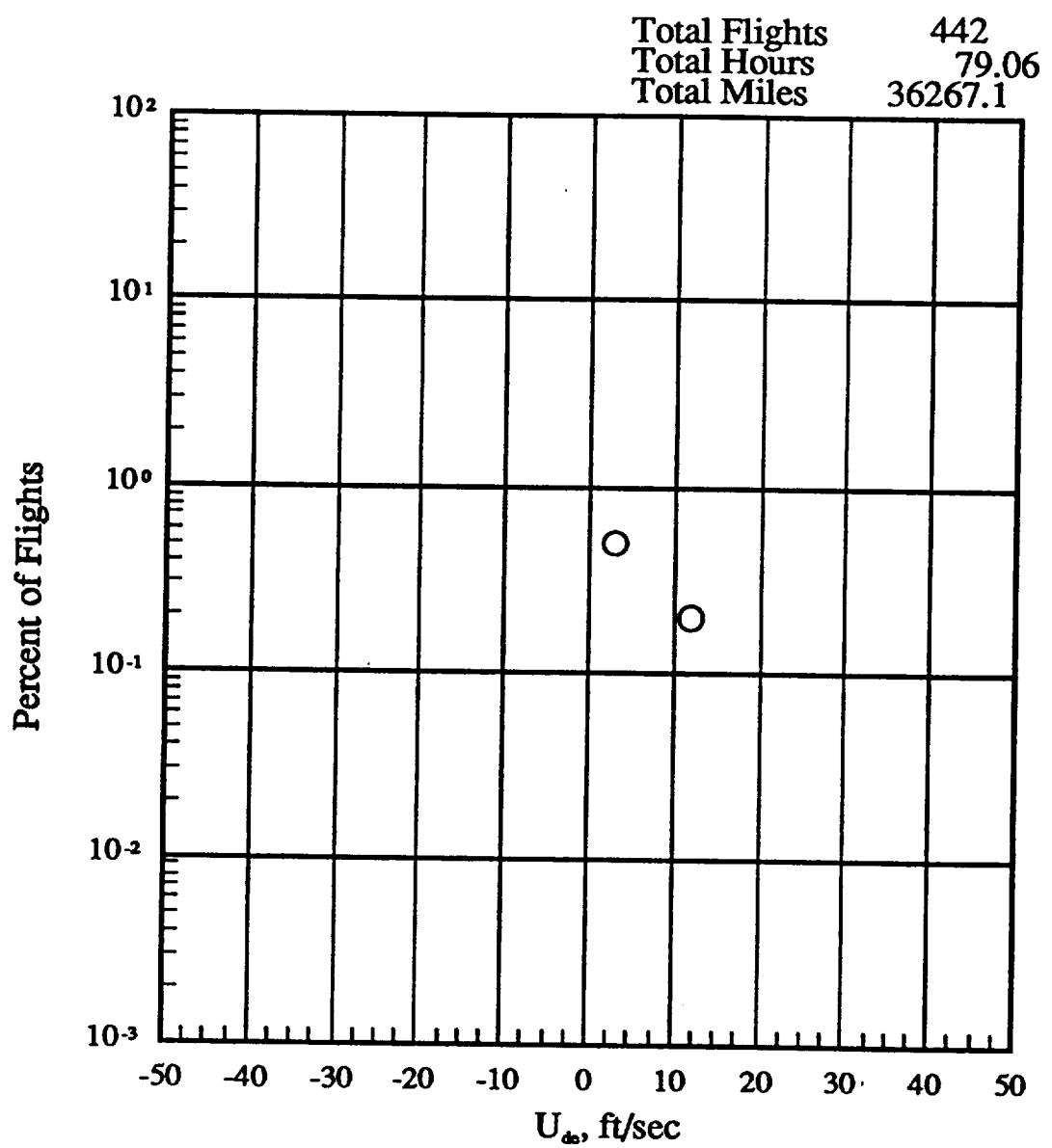
(e) 14500 to 19500 feet altitude

Figure 19.- Continued.



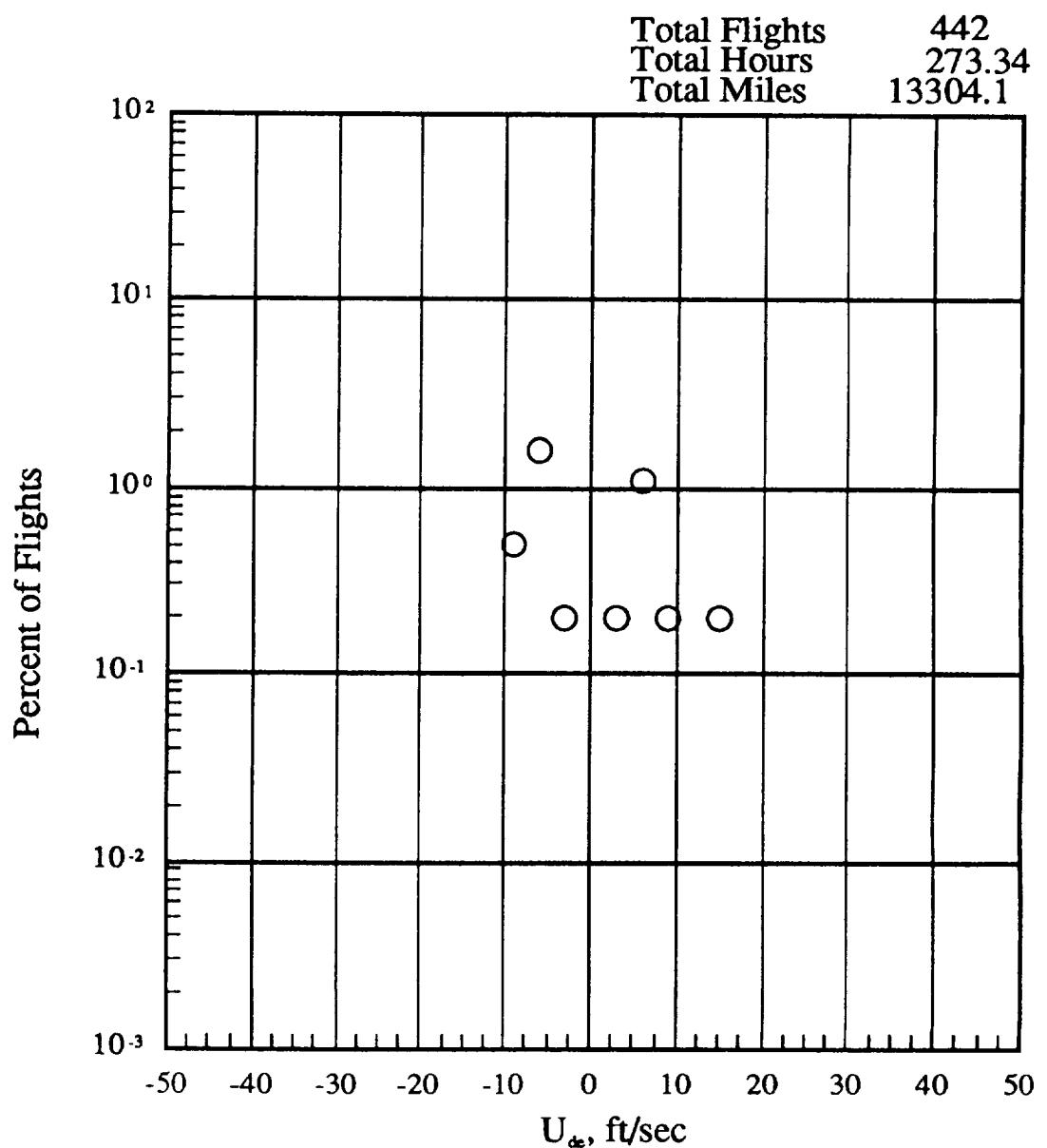
(f) 19500 to 24500 feet altitude

Figure 19.- Continued.



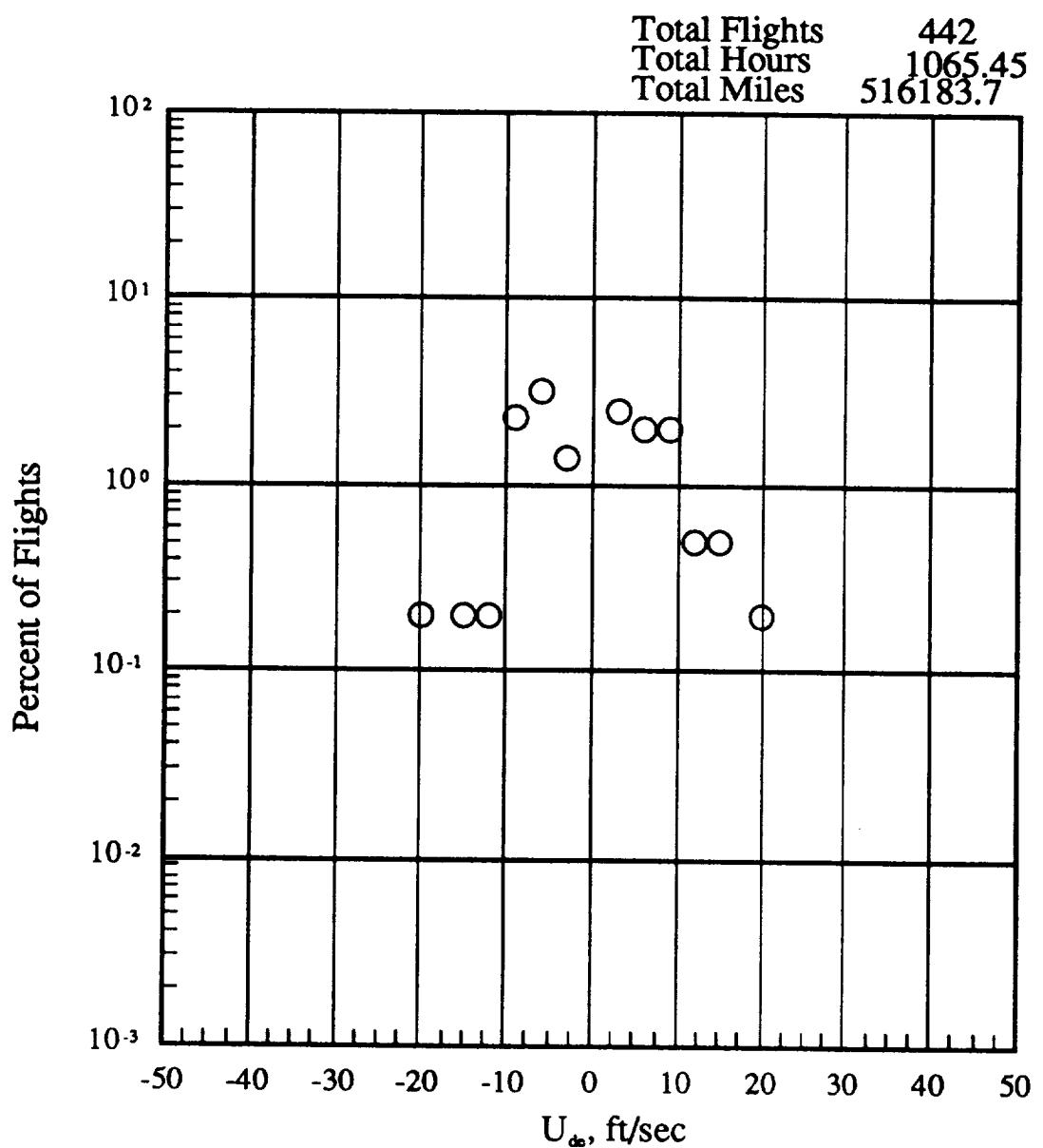
(g) 24500 to 29500 feet altitude

Figure 19.- Continued.



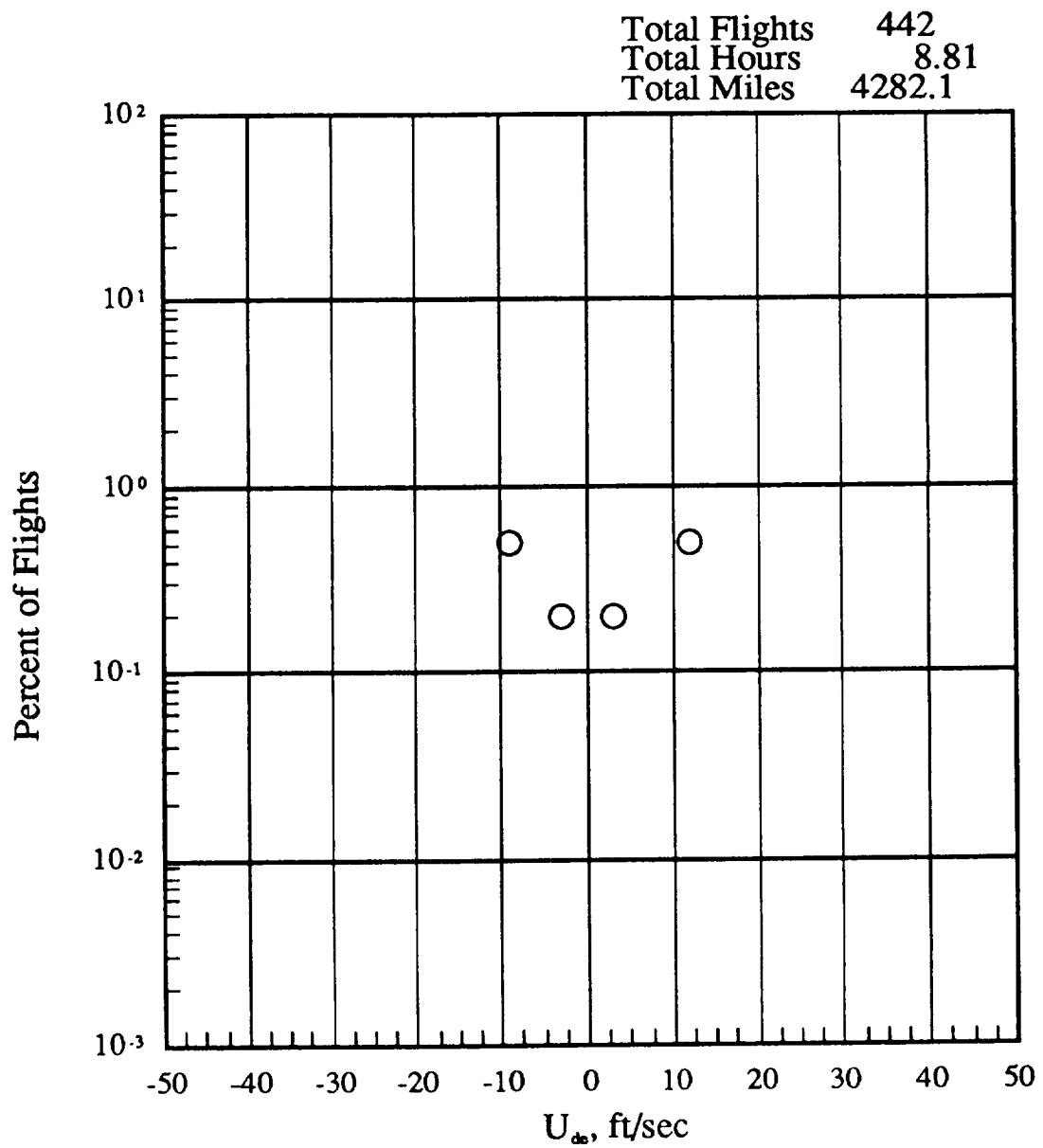
(h) 29500 to 34500 feet altitude

Figure 19.- Continued.



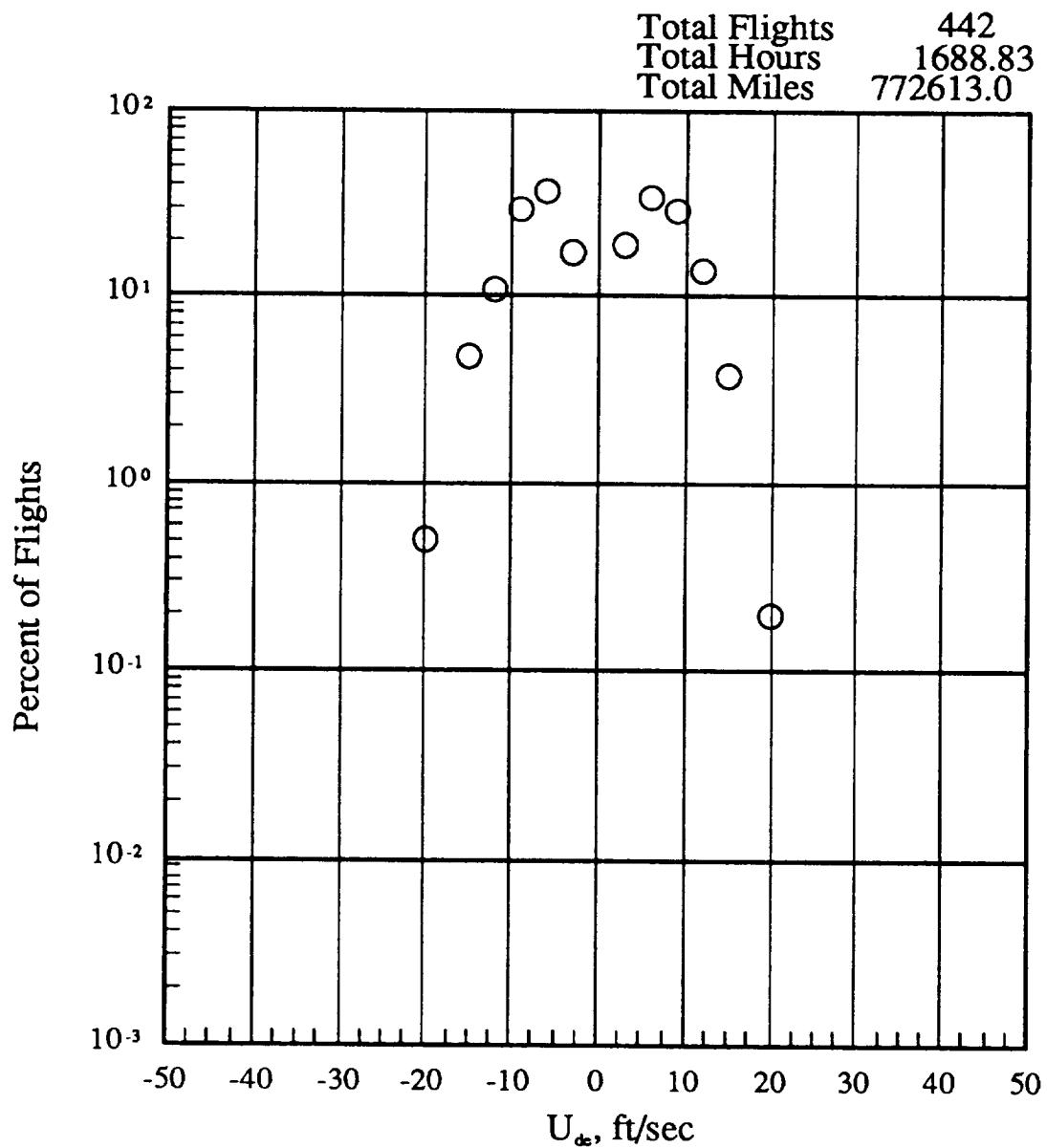
(i) 34500 to 39500 feet altitude

Figure 19.- Continued.



(j) 39500 to 44500 feet altitude

Figure 19.- Continued.



(k) -500 to 44500 feet altitude

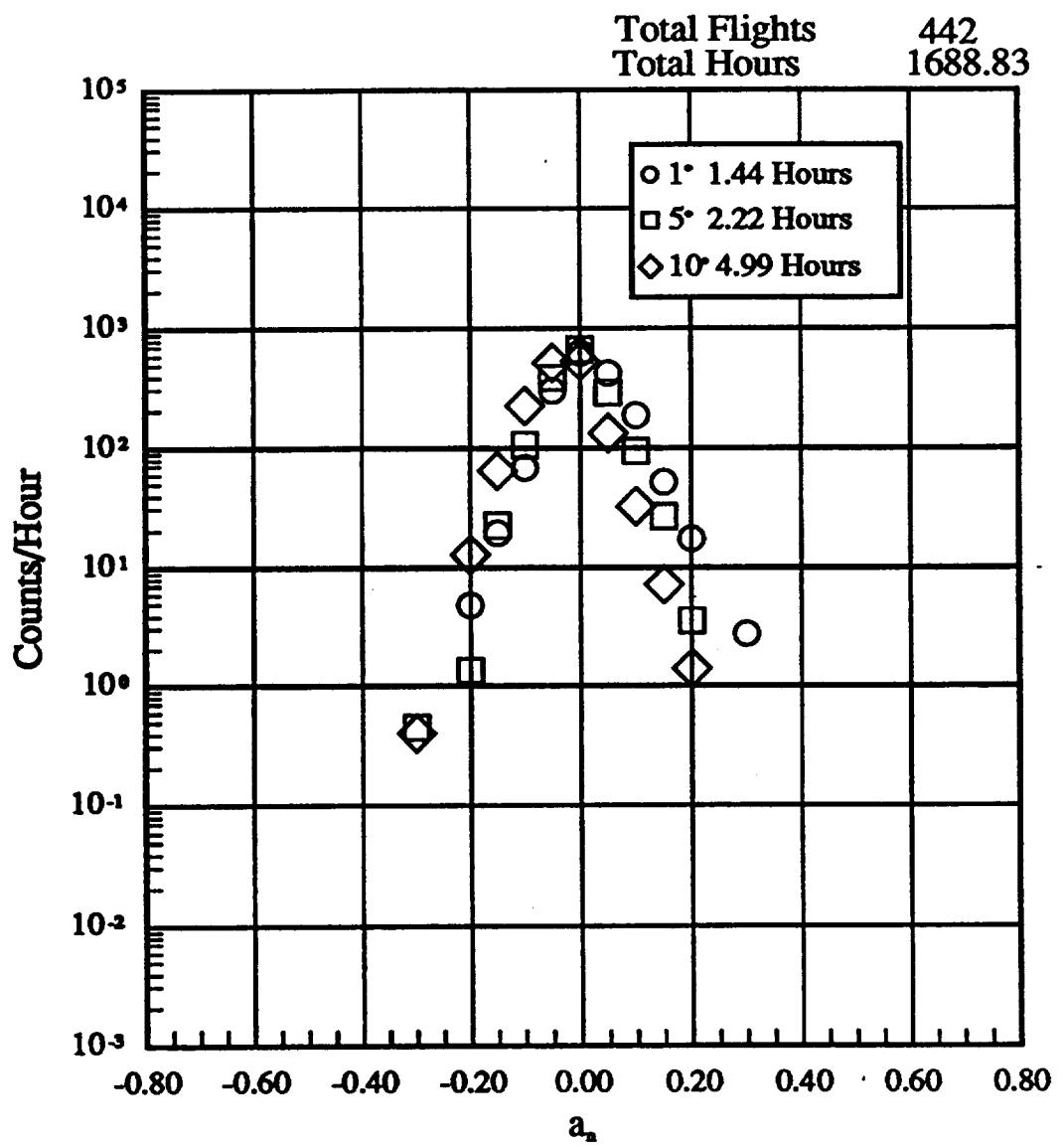
Figure 19.- Concluded.

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$a_n$	LEVEL	1	5	10	20	25	30
	G'S	0	0	0	0	0	0
1.60	0	0	0	0	0	0	0
1.40	0	0	0	0	0	0	0
1.20	0	0	0	0	0	0	0
1.00	0	0	0	0	0	0	0
.80	0	0	0	0	0	0	0
.70	0	0	0	0	0	0	0
.60	0	0	0	0	0	0	0
.50	0	0	0	0	0	0	0
.40	0	0	0	0	0	0	0
.30	2.778	0	0	0	0	0	0
.20	17.363	3.601	1.402	0	0	0	0
.15	51.394	26.557	7.210	0	0	0	0
.10	186.129	93.626	32.245	0	0	0	0
.05	422.263	289.882	132.384	0	0	0	0
0	622.977	670.689	531.939	0	0	0	0
-.05	300.029	384.408	514.515	0	0	0	0
-.10	68.062	106.230	223.711	0	0	0	0
-.15	19.446	22.506	64.490	0	0	0	0
-.20	4.862	1.350	12.818	0	0	0	0
-.30	0	0.450	0.401	0	0	0	0
-.40	0	0	0	0	0	0	0
-.50	0	0	0	0	0	0	0
-.60	0	0	0	0	0	0	0
-.70	0	0	0	0	0	0	0
-.80	0	0	0	0	0	0	0
-.90	0	0	0	0	0	0	0
-1.00	0	0	0	0	0	0	0
-1.20	0	0	0	0	0	0	0
-1.40	0	0	0	0	0	0	0
-1.60	0	0	0	0	0	0	0
	FLIGHT HOURS IN DETENT	1.440	2.222	4.993	0	0	0
	TOTAL HOURS				8.65		
	TOTAL FLIGHTS				442		
	TOTAL FLIGHT HOURS FLAPS UP AND DOWN				1698.83		
	TOTAL FLIGHT MILES FLAPS UP AND DOWN				772612.93		

(a) Take off

Figure 20.-  $a_n$  exceedances with flaps deflected.

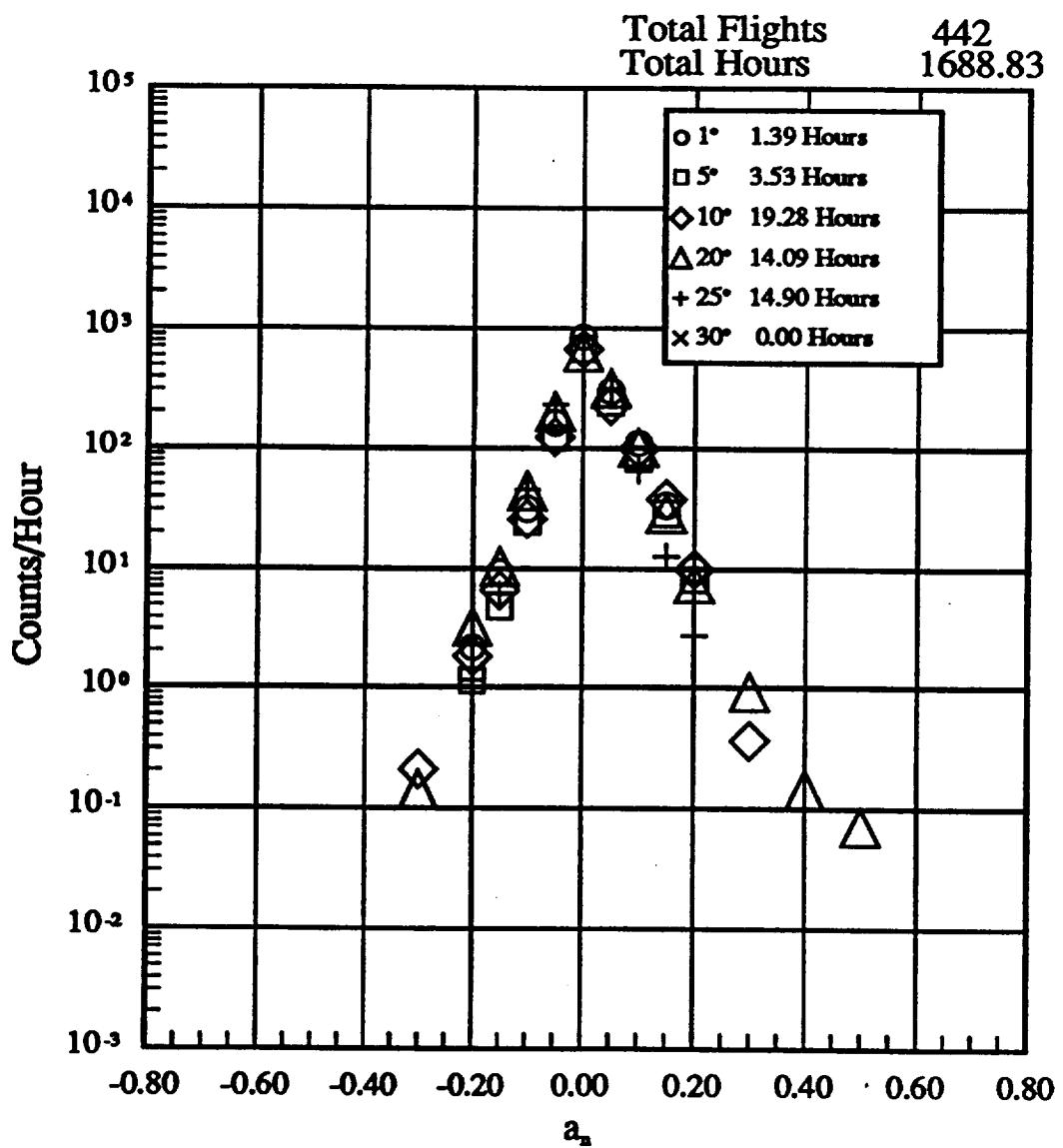


(b) Take off

Figure 20.- Continued.

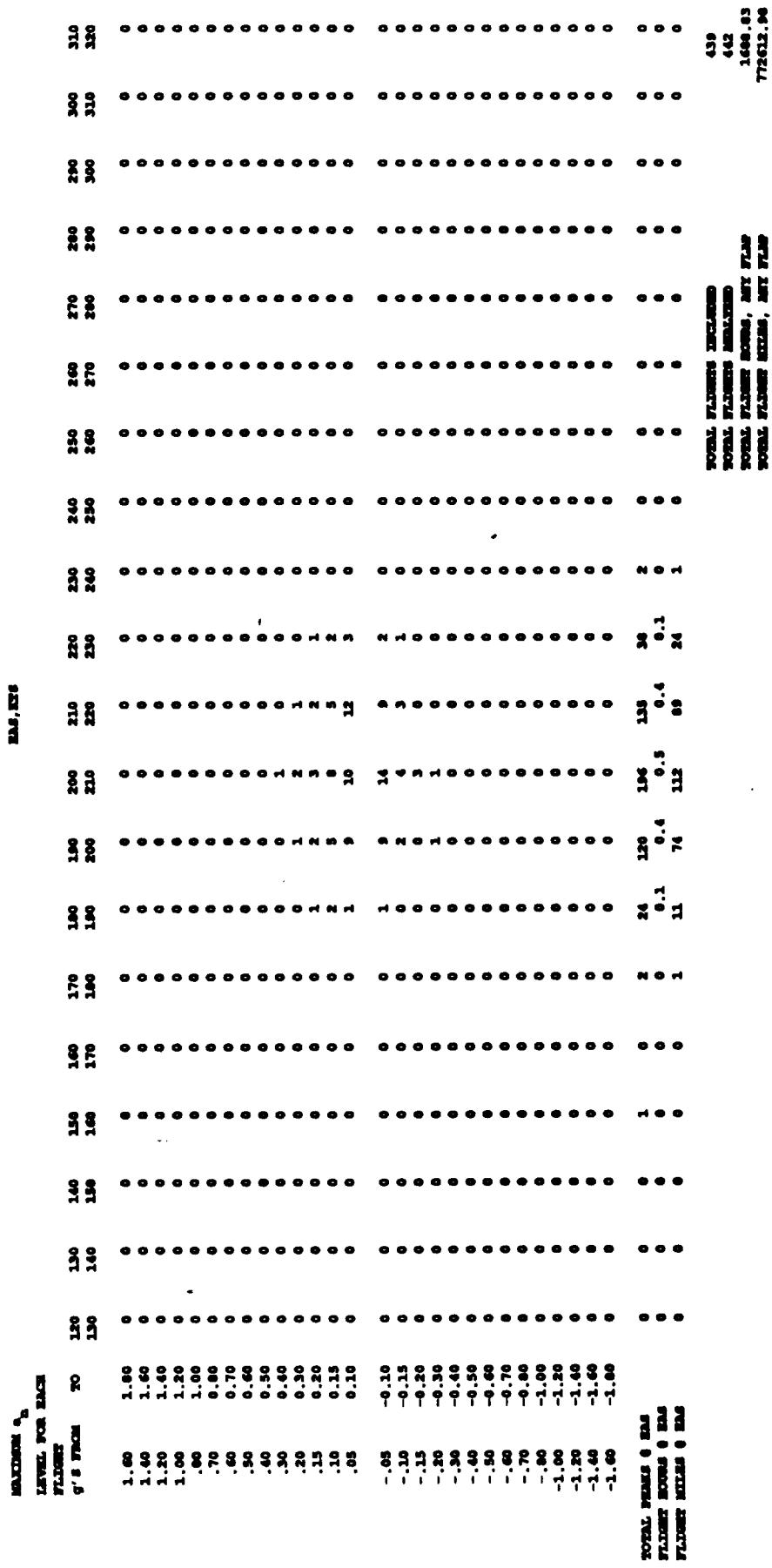
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Figure 20.- Continued.



(d) Landing.

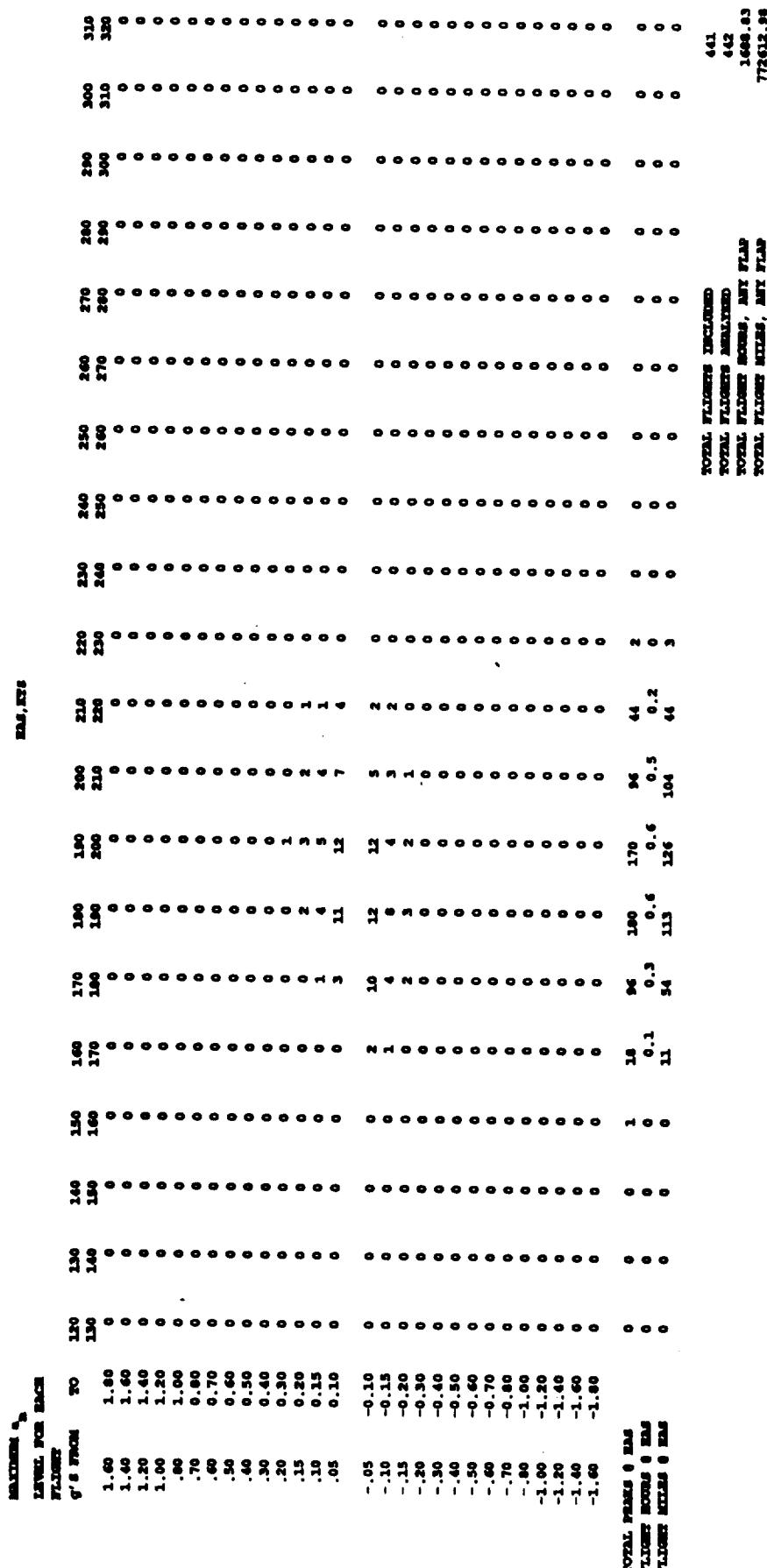
Figure 20.- Concluded.



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(a) Take off, flaps 1 degree detent

Figure 21.- Peak positive and negative  $\alpha_p$  and  $\alpha_n$  per flight vs EAS bands; percent of flights.



(b) Take off, flaps 5 degree defent

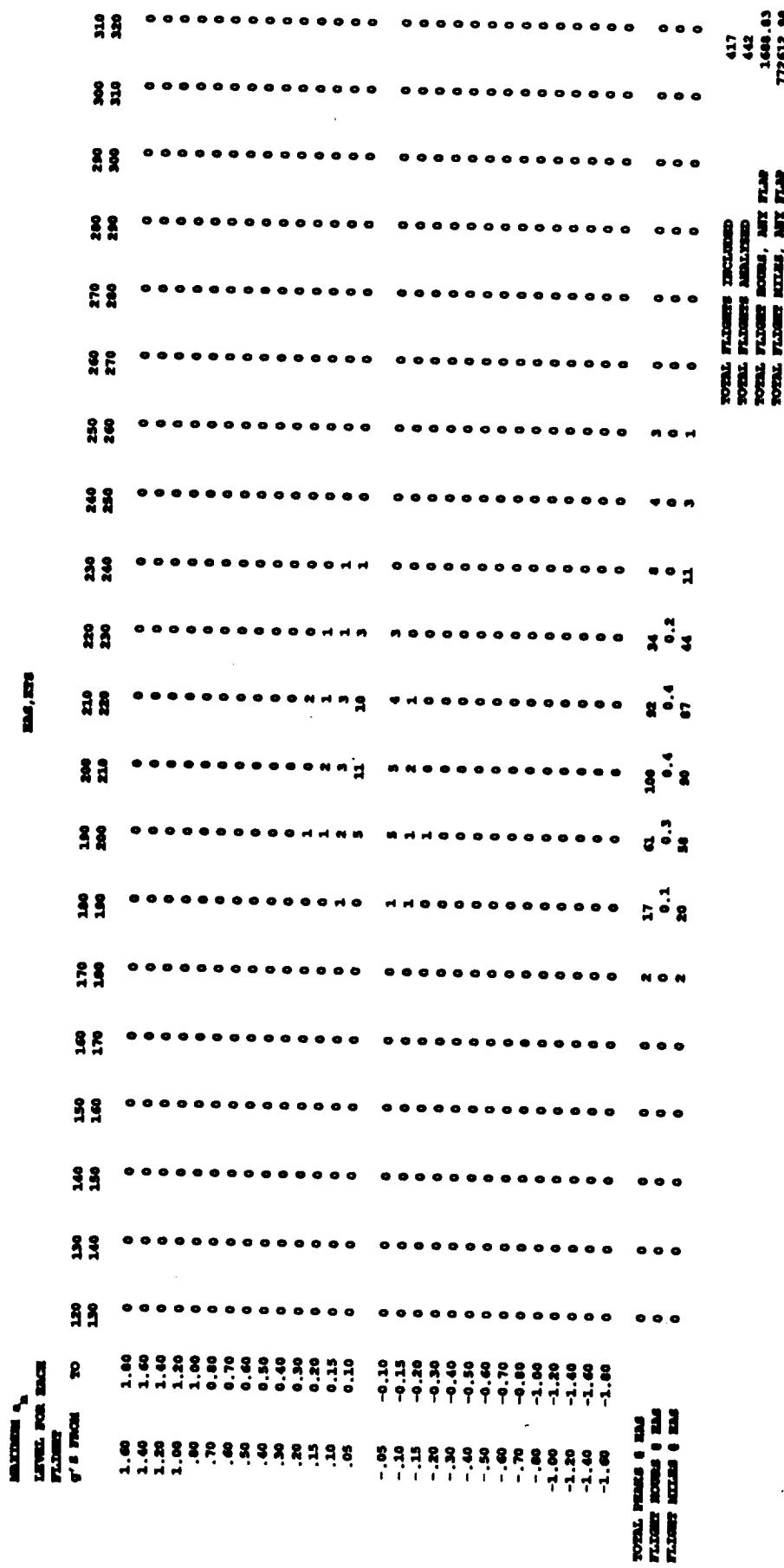
Figure 21.- Continued.

MANEUVER % LEVEL FOR EACH FLIGHT	9.8 FROM	MAS, FT/SEC										TOTAL FLIGHTS INCLUDED TOTAL FLIGHTS INCLUDED TOTAL FLIGHTS INCLUDED, ANY FLAP TOTAL FLIGHTS INCLUDED, ANY FLAP
		120	130	140	150	160	170	180	190	200	210	
1.60	1.80	-	-	-	-	-	-	-	-	-	-	440.50
1.40	1.60	-0.20	-0.40	-0.60	-0.80	-1.00	-1.20	-1.40	-1.60	-1.80	-2.00	440
1.20	1.40	-0.40	-0.80	-1.20	-1.60	-2.00	-2.40	-2.80	-3.20	-3.60	-4.00	1660.83
1.00	1.20	-0.60	-1.20	-1.80	-2.40	-3.00	-3.60	-4.20	-4.80	-5.40	-6.00	772612.98
.80	1.00	-0.80	-1.60	-2.40	-3.20	-4.00	-4.80	-5.60	-6.40	-7.20	-8.00	
.60	0.80	-1.00	-2.00	-3.00	-4.00	-5.00	-6.00	-7.00	-8.00	-9.00	-10.00	
.40	0.60	-1.20	-2.40	-3.60	-4.80	-6.00	-7.20	-8.40	-9.60	-10.80	-12.00	
.20	0.40	-0.20	-0.40	-0.60	-0.80	-1.00	-1.20	-1.40	-1.60	-1.80	-2.00	
-.05	-0.10	0	0	0	0	0	0	0	0	0	0	
-1.20	-0.15	0	0	0	0	0	0	0	0	0	0	
-1.15	-0.20	0	0	0	0	0	0	0	0	0	0	
-1.20	-0.30	0	0	0	0	0	0	0	0	0	0	
-1.20	-0.40	0	0	0	0	0	0	0	0	0	0	
-1.40	-0.50	0	0	0	0	0	0	0	0	0	0	
-1.50	-0.60	0	0	0	0	0	0	0	0	0	0	
-1.60	-0.70	0	0	0	0	0	0	0	0	0	0	
-1.70	-0.80	0	0	0	0	0	0	0	0	0	0	
-1.80	-1.00	0	0	0	0	0	0	0	0	0	0	
-1.90	-1.20	0	0	0	0	0	0	0	0	0	0	
-1.20	-1.40	0	0	0	0	0	0	0	0	0	0	
-1.40	-1.60	0	0	0	0	0	0	0	0	0	0	
-1.60	-1.80	0	0	0	0	0	0	0	0	0	0	
		33	210	190	126	72	35	44	44	44	44	
		31	213	213	202	202	202	202	202	202	202	
		0.2	1.3	1.3	1.1	0.6	0.2	0.2	0.2	0.2	0.2	

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(c) Take off; flaps 10 degree detent

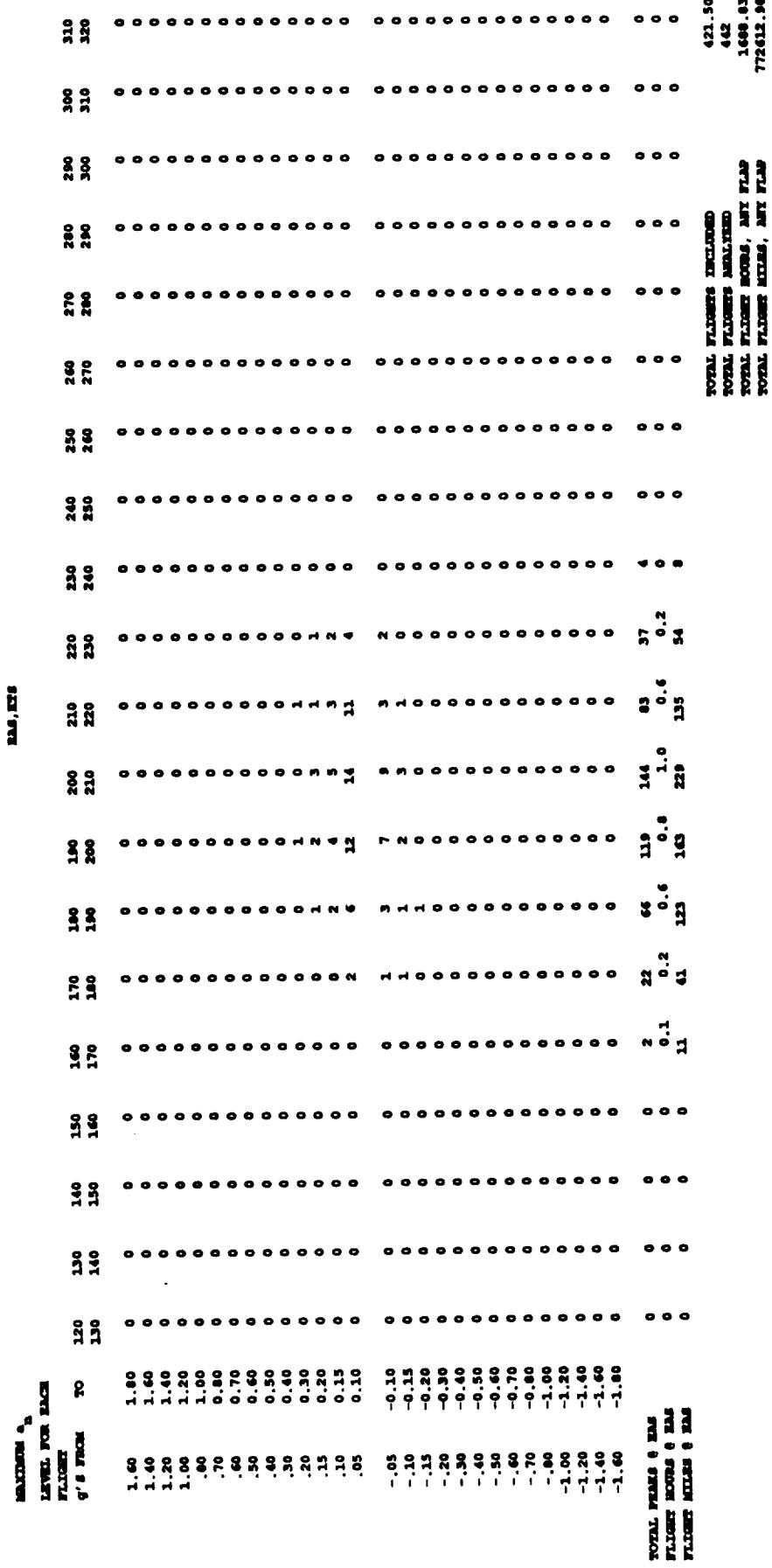
Figure 21.- Continued.



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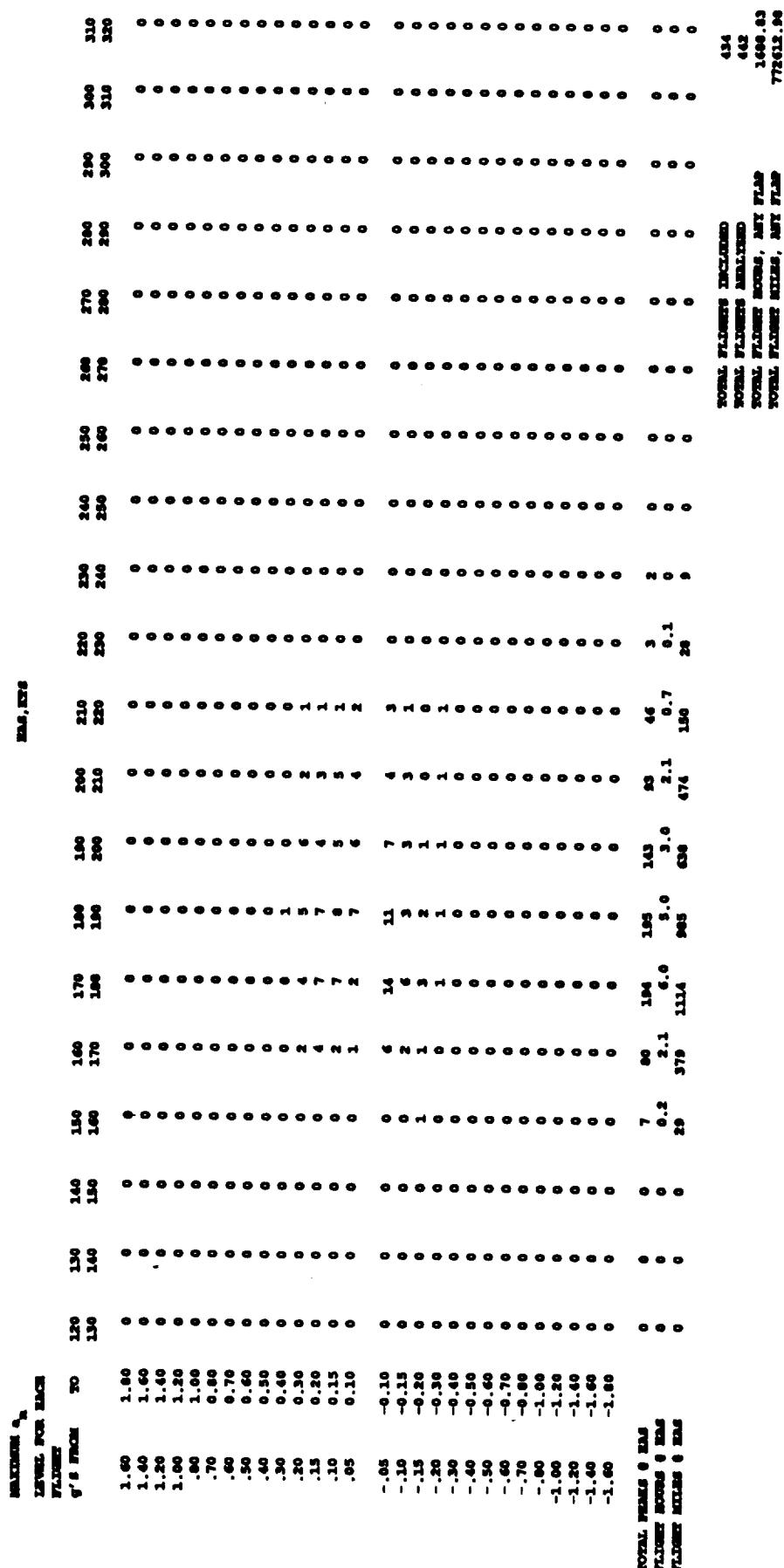
(d) Landing; flaps 1 degree detent

Figure 21.- Continued.



(e) Landing; flaps 5 degree detent

Figure 21.- Continued.



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(f) Landing; flaps 15 degree defent.

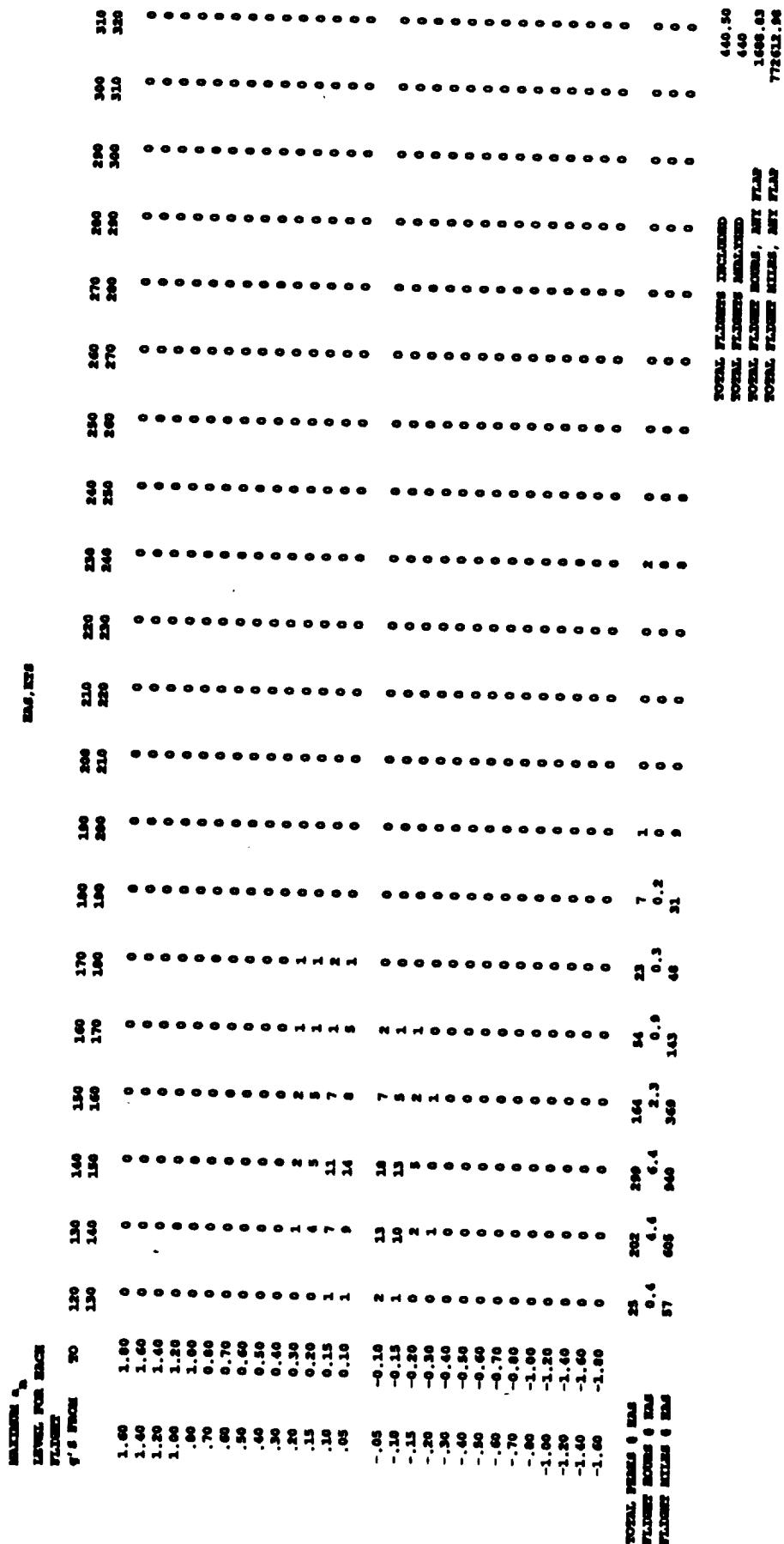
Figure 21.- Continued.

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MANEUVER % LEVEL FOR MACH	FLIGHT g's FROM	MAS, FT/S										TOTAL FLIGHTS DECODED TOTAL FLIGHTS ANALYZED TOTAL FLIGHTS STORED, NOT FLAP TOTAL FLIGHTS STORED, FLAP 772612.93
		200	210	220	230	240	250	260	270	280	290	
1.60	1.60	0	0	0	0	0	0	0	0	0	0	0
1.40	1.60	0	0	0	0	0	0	0	0	0	0	0
1.20	1.40	0	0	0	0	0	0	0	0	0	0	0
1.00	1.20	0	0	0	0	0	0	0	0	0	0	0
-0.80	1.00	0	0	0	0	0	0	0	0	0	0	0
-0.70	0.80	0	0	0	0	0	0	0	0	0	0	0
.60	0.70	0	0	0	0	0	0	0	0	0	0	0
.50	0.60	0	0	0	0	0	0	0	0	0	0	0
.40	0.50	0	0	0	0	0	0	0	0	0	0	0
.30	0.40	0	0	0	0	0	0	0	0	0	0	0
.20	0.30	0	0	0	0	0	0	0	0	0	0	0
.15	0.20	0	0	0	0	0	0	0	0	0	0	0
.10	0.15	0	0	0	0	0	0	0	0	0	0	0
.05	0.10	0	0	0	0	0	0	0	0	0	0	0
-0.05	-0.10	0	0	0	0	0	0	0	0	0	0	0
-0.10	-0.15	0	0	0	0	0	0	0	0	0	0	0
-0.15	-0.20	0	0	0	0	0	0	0	0	0	0	0
-0.20	-0.30	0	0	0	0	0	0	0	0	0	0	0
-0.30	-0.40	0	0	0	0	0	0	0	0	0	0	0
-0.40	-0.50	0	0	0	0	0	0	0	0	0	0	0
-0.50	-0.60	0	0	0	0	0	0	0	0	0	0	0
-0.60	-0.70	0	0	0	0	0	0	0	0	0	0	0
-0.70	-0.80	0	0	0	0	0	0	0	0	0	0	0
-0.80	-1.00	0	0	0	0	0	0	0	0	0	0	0
-1.00	-1.20	0	0	0	0	0	0	0	0	0	0	0
-1.20	-1.40	0	0	0	0	0	0	0	0	0	0	0
-1.40	-1.60	0	0	0	0	0	0	0	0	0	0	0
-1.60	-1.80	0	0	0	0	0	0	0	0	0	0	0
TOTAL FLIGHTS & MAS		3	58	148	224	297	391	561	723	894	1065	1236
FLIGHTS STORED & MAS		0.1	1.2	3.5	4.2	5.0	5.3	6.5	7.8	9.1	10.1	11.8
FLIGHTS STORED & MAS		21	268	570	718	940	1239	1645	2094	2511	2918	3220

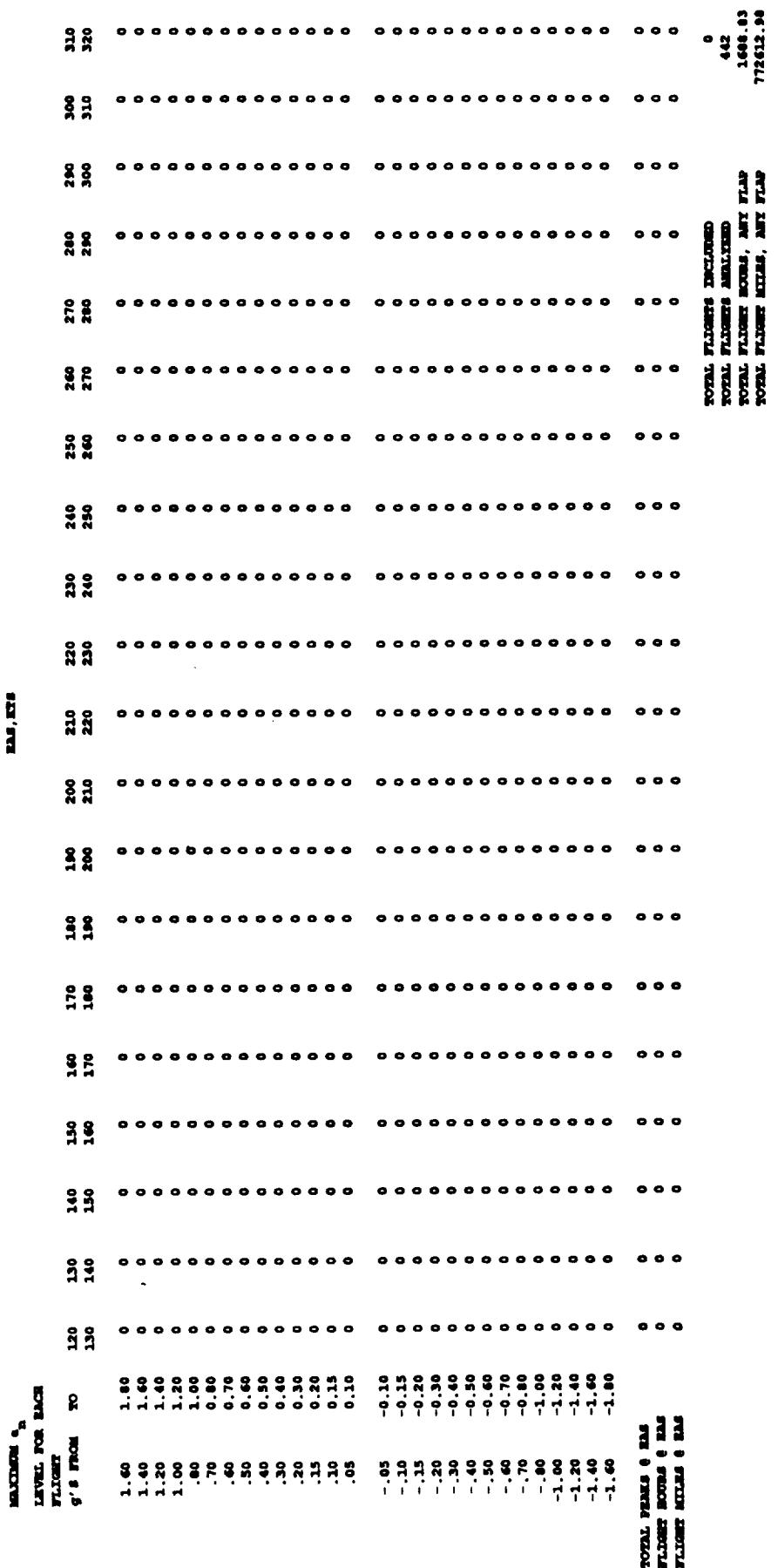
(g) Landing; flaps 20 degree detent

Figure 21.- Continued.



(h) Landing; flaps 25 degree defent

Figure 21.- Continued.



(i) Landing; flaps 30 degree detent

Figure 21.- Concluded.

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LEVEL g's	PRESSURE ALTITUDE BANDS										TOTAL FLIGHTS	TOTAL FLIGHT MILES FLAPS UP AND DOWN	TOTAL FLIGHT MILES FLAPS UP AND DOWN
	-500 TO 4500 FT	4500 TO 9500 FT	9500 TO 14500 FT	14500 TO 19500 FT	19500 TO 24500 FT	24500 TO 29500 FT	29500 TO 34500 FT	34500 TO 39500 FT	39500 TO 44500 FT				
.160	0	0	0	0	0	0	0	0	0	0	0	0	0
.140	0	0	0	0	0	0	0	0	0	0	0	0	0
.120	0	0	0	0	0	0	0	0	0	0	0	0	0
.100	0	0	0	0	0	0	0	0	0	0	0	0	0
.80	0	0	0	0	0	0	0	0	0	0	0	0	0
.70	0	0	0	0	0	0	0	0	0	0	0	0	0
.60	0	0	0	0	0	0	0	0	0	0	0	0	0
.50	0	0	0	0	0	0	0	0	0	0	0	0	0
.40	0.20	0.96	0	0	0	0	0	0	0	0	0	0	0
.30	1.76	1.91	0	0	0	0	0	0	0	0	0	0	0.17
.20	36.54	11.47	3.24	1.47	0	0	0	0.93	0.79	0.29	0	0	1.03
.15	106.10	20.47	8.91	1.47	2.81	2.80	2.80	0	0	0	0	0	17.08
.10	244.45	52.56	31.59	4.41	8.43	7.48	5.51	0	0	0	0	0	49.16
.05	461.34	177.75	126.34	52.88	51.99	10.28	19.69	3.60	0	0	0	0	114.96
0	777.20	556.20	744.30	934.15	781.26	90.55	90.55	33.71	33.71	0	0	0	238.15
-.05	410.93	124.24	108.53	86.66	61.83	1016.82	895.83	1031.29	864.17	0	0	0	0
-.10	151.63	27.71	16.20	7.34	5.62	46.73	62.99	17.14	17.14	0	0	0	207.88
-.15	54.81	11.47	10.53	1.47	0	8.41	8.66	3.03	3.03	0	0	0	71.19
-.20	19.34	0	3.24	0	0	7.48	2.36	1.01	1.01	0	0	0	26.09
-.30	1.56	0	0	0	0	5.61	2.36	0.43	0.43	0	0	0	9.23
-.40	0.10	0	0	0	0	0	0	0.14	0.14	0	0	0	0.73
-.50	0	0	0	0	0	0	0	0	0	0	0	0	0.04
-.60	0	0	0	0	0	0	0	0	0	0	0	0	0
-.70	0	0	0	0	0	0	0	0	0	0	0	0	0
-.80	0	0	0	0	0	0	0	0	0	0	0	0	0
-.90	0	0	0	0	0	0	0	0	0	0	0	0	0
-1.00	0	0	0	0	0	0	0	0	0	0	0	0	0
-1.20	0	0	0	0	0	0	0	0	0	0	0	0	0
-1.40	0	0	0	0	0	0	0	0	0	0	0	0	0
-1.60	0	0	0	0	0	0	0	0	0	0	0	0	0
FLIGHT HOURS @ ALT	10.24	1.05	1.23	0.68	0.71	1.07	1.27	6.94	6.94	0	0	0	23.19
FLIGHT MILES @ ALT	1614.46	278.29	435.09	273.62	305.17	508.15	620.66	3369.31	3369.31	0	0	0	7604.77
TOTAL FLIGHTS										73			
TOTAL FLIGHT MILES FLAPS UP AND DOWN										23.19			
TOTAL FLIGHT MILES FLAPS UP AND DOWN										7604.77			

(a)  $a_n$  Level crossing counts per hour within pressure altitude bands

Figure 22.- Normal acceleration exceedances: Non-revenue flights.

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a <sub>IM</sub> LEVEL	g's	PRESSURE ALTITUDE BANDS										-500 TO 44500 FT
		-500 TO 4500 FT	4500 TO 9500 FT	9500 TO 14500 FT	14500 TO 19500 FT	1950 TO 24500 FT	24500 TO 29500 FT	29500 TO 34500 FT	34500 TO 39500 FT	39500 TO 44500 FT	-500 TO 44500 FT	
.60	0	0	0	0	0	0	0	0	0	0	0	0
.80	0	0	0	0	0	0	0	0	0	0	0	0
.70	0	0	0	0	0	0	0	0	0	0	0	0
.60	0	0	0	0	0	0	0	0	0	0	0	0
.50	0	0	0	0	0	0	0	0	0	0	0	0
.40	0	0	0	0	0	0	0	0	0	0	0	0
.30	0	0.96	0	0	0	0	0.93	0	0	0.14	0	0.13
.20	2.34	2.87	0	1.47	0	0	0.93	0.79	0	0.14	0	1.34
.15	12.11	4.78	0.81	1.47	0	0	1.87	1.57	0	0.14	0	5.86
.10	36.54	10.51	5.67	2.94	0	2.80	2.36	0.43	0	0	0	17.38
.05	71.13	37.27	30.78	13.22	5.62	9.35	15.75	4.18	0	0	0	37.82
0	170.29	122.33	123.91	138.07	119.44	151.40	169.29	143.76	0	0	0	151.28
-.05	55.98	23.89	19.44	13.22	7.03	12.15	7.87	2.74	0	0	0	29.24
-.10	11.33	5.73	3.24	2.94	1.41	3.74	0	0	0	0	0	5.86
-.15	2.74	0.96	0	1.47	0	1.87	0	0.29	0	0	0	1.47
-.20	0.98	0	0	0	0	0.93	0	0.14	0	0	0	0.52
-.30	0	0	0	0	0	0	0	0	0	0	0	0
-.40	0	0	0	0	0	0	0	0	0	0	0	0
-.50	0	0	0	0	0	0	0	0	0	0	0	0
-.60	0	0	0	0	0	0	0	0	0	0	0	0
-.70	0	0	0	0	0	0	0	0	0	0	0	0
-.80	0	0	0	0	0	0	0	0	0	0	0	0
-.90	0	0	0	0	0	0	0	0	0	0	0	0
-.100	0	0	0	0	0	0	0	0	0	0	0	0
-.120	0	0	0	0	0	0	0	0	0	0	0	0
-.140	0	0	0	0	0	0	0	0	0	0	0	0
-.160	0	0	0	0	0	0	0	0	0	0	0	0
FLIGHT HOURS @ ALT	10.24	1.05	1.23	0.68	0.71	1.07	1.27	6.94	0	23.19	73	
FLIGHT MILES @ ALT	1814.48	278.29	435.09	273.62	305.17	508.15	620.66	3369.31	0	7604.77	23.19	
TOTAL FLIGHTS												
TOTAL FLIGHT HOURS												
TOTAL FLIGHT MILES												

(b) anM Level crossing counts per hour within pressure altitude bands

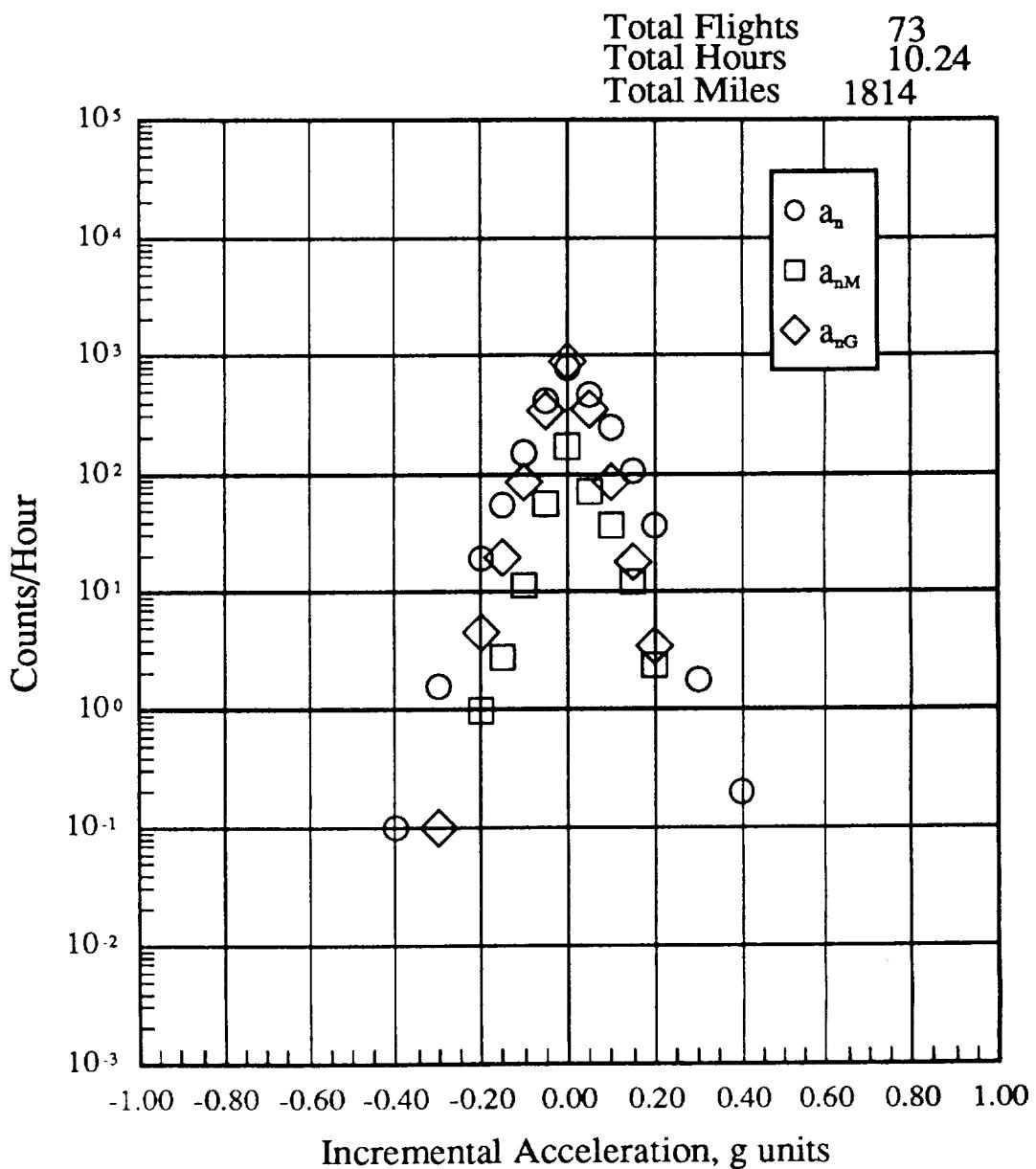
Figure 22.- Continued.

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$a_{HG}$ LEVEL g's	PRESSURE ALTITUDE BANDS										TOTAL FLIGHTS 73	TOTAL FLIGHT SECONDS FLAPS UP AND DOWN 23.19	TOTAL FLIGHT MILES FLAPS UP AND DOWN 7604.77
	-500 TO 4500 FT	4500 TO 9500 FT	9500 TO 14500 FT	14500 TO 19500 FT	19500 TO 24500 FT	24500 TO 29500 FT	29500 TO 34500 FT	34500 TO 39500 FT	39500 TO 44500 FT				
1.60	0	0	0	0	0	0	0	0	0	0	0	0	0
1.40	0	0	0	0	0	0	0	0	0	0	0	0	0
1.20	0	0	0	0	0	0	0	0	0	0	0	0	0
1.00	0	0	0	0	0	0	0	0	0	0	0	0	0
.80	0	0	0	0	0	0	0	0	0	0	0	0	0
.70	0	0	0	0	0	0	0	0	0	0	0	0	0
.60	0	0	0	0	0	0	0	0	0	0	0	0	0
.50	0	0	0	0	0	0	0	0	0	0	0	0	0
.40	0	0	0	0	0	0	0	0	0	0	0	0	0
.30	0	0	0	0	0	0	0	0	0	0	0	0	0
.20	3.42	0	0	0	0	0	0	0	0	0	0	0	0
.15	17.88	0	2.43	0	0	0	0	0	0	0	0	0	1.68
.10	85.98	0	2.87	3.24	0	0	0	2.80	0	0	0	0	8.37
.05	346.59	11.47	8.10	0	4.22	3.74	3.15	0.72	0	0	0	0	39.58
0	880.96	69.76	26.73	19.09	9.84	21.50	24.41	7.78	0	0	0	0	163.94
-.05	338.24	820.92	888.46	987.03	1001.87	1074.77	981.89	1122.45	0	0	0	0	972.23
-.10	85.88	64.03	29.16	13.22	15.46	17.76	23.62	5.76	0	0	0	0	158.42
-.15	19.64	9.56	6.10	0	0	0	7.48	3.94	0.58	0	0	0	39.50
-.20	4.49	0.96	6.48	0	0	0	3.74	0.79	0.14	0	0	0	9.31
-.30	0.10	0.96	3.24	0	0	0	1.87	0	0	0	0	0	2.29
-.40	0	0	0	0	0	0	0	0	0	0	0	0	0.04
-.50	0	0	0	0	0	0	0	0	0	0	0	0	0
-.60	0	0	0	0	0	0	0	0	0	0	0	0	0
-.70	0	0	0	0	0	0	0	0	0	0	0	0	0
-.80	0	0	0	0	0	0	0	0	0	0	0	0	0
-.90	0	0	0	0	0	0	0	0	0	0	0	0	0
-1.00	0	0	0	0	0	0	0	0	0	0	0	0	0
-1.20	0	0	0	0	0	0	0	0	0	0	0	0	0
-1.40	0	0	0	0	0	0	0	0	0	0	0	0	0
-1.60	0	0	0	0	0	0	0	0	0	0	0	0	0
FLIGHT HOURS & AVG		10.24	1.05	1.23	0.68	0.71	1.07	1.27	6.94	0	23.19		
FLIGHT MILES & AVG		1614.48	278.29	435.09	273.62	305.17	508.15	620.66	3369.31	0	7604.77		

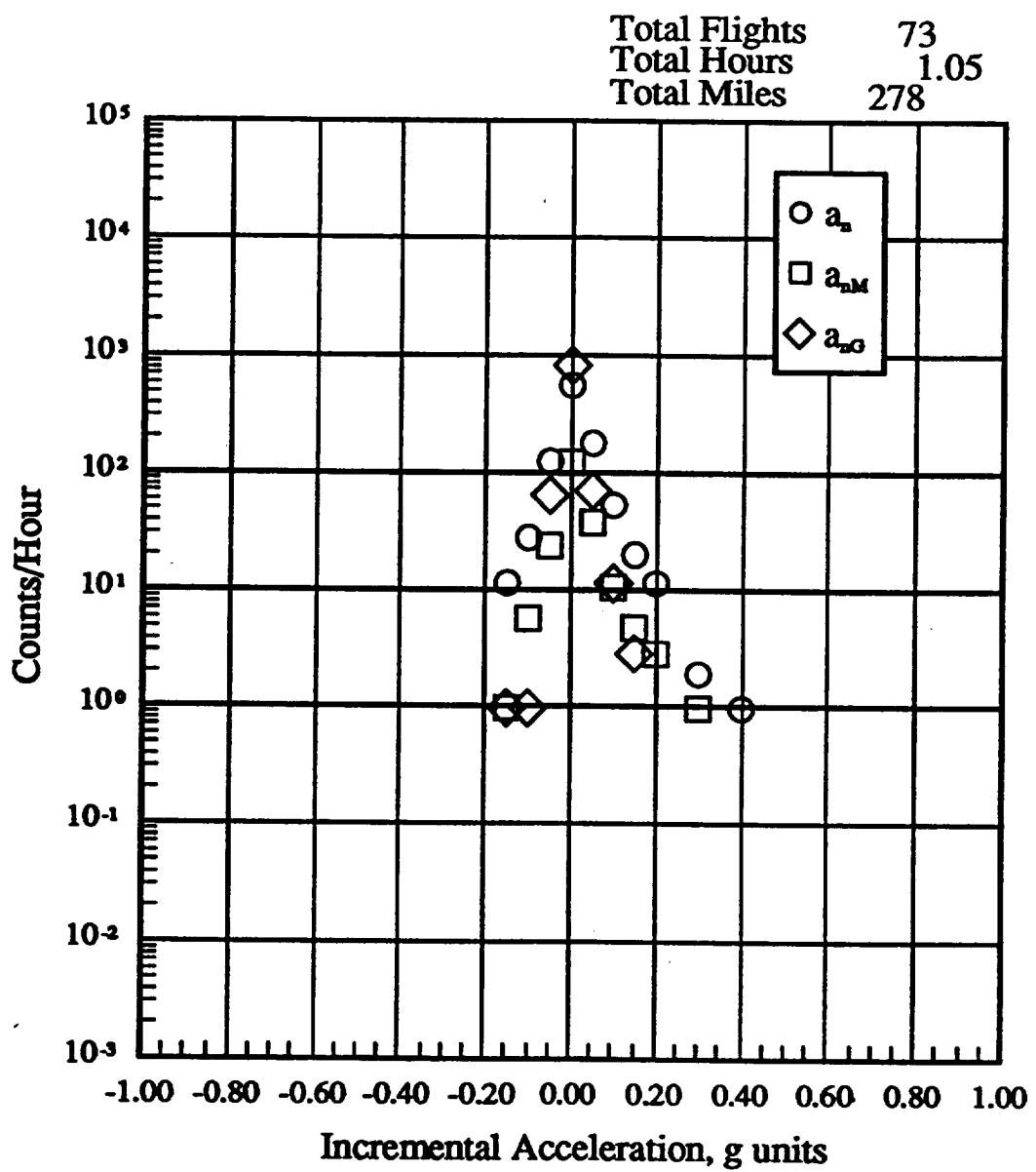
(c)  $a_{HG}$  Level crossing counts per hour within pressure altitude bands

Figure 22.- Continued.



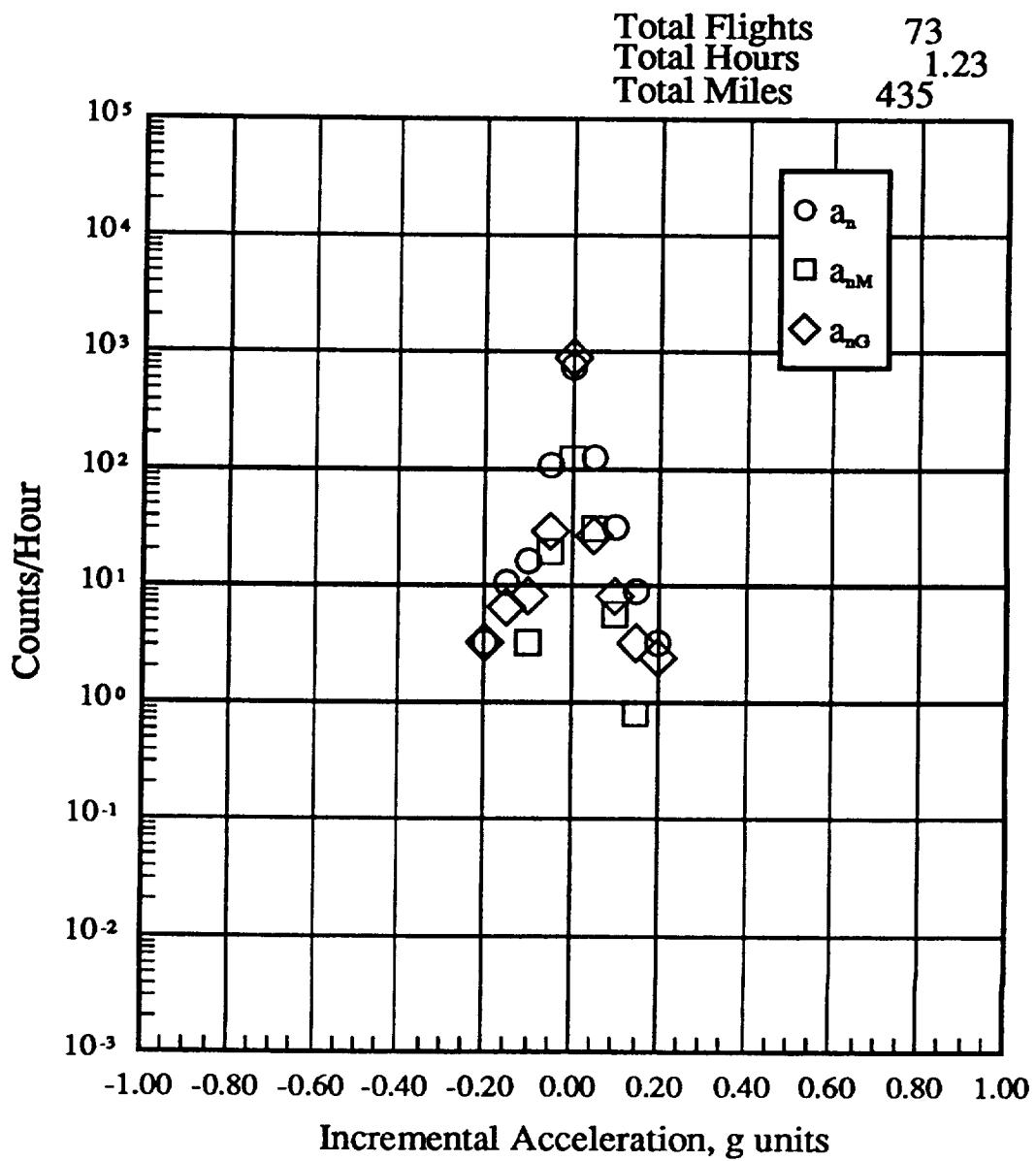
(d)  $a_n$ ,  $a_{nM}$ ,  $a_{nG}$ , -500 to 4500 feet altitude

Figure 22.- Continued.



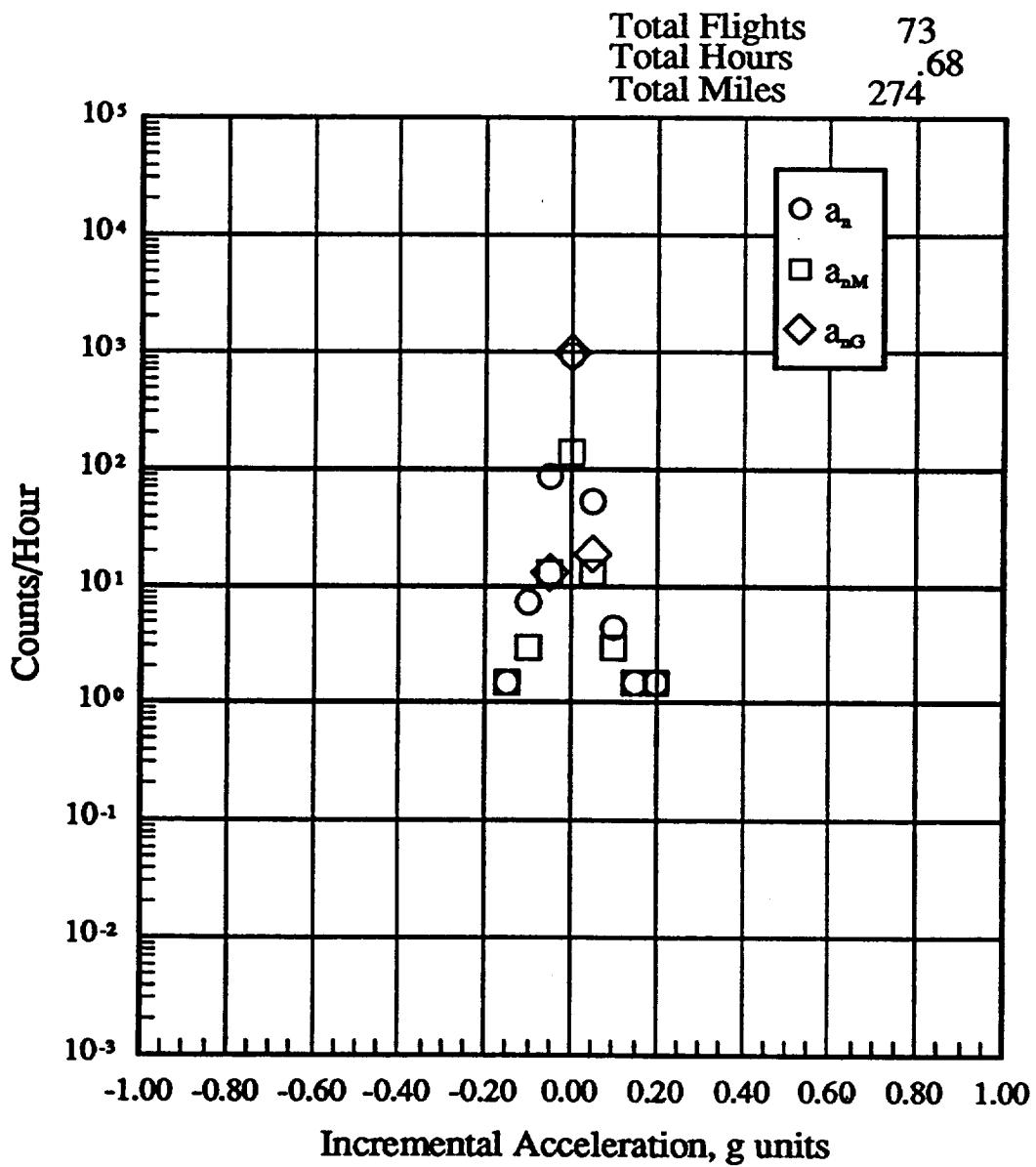
(e)  $a_n$ ,  $a_{nm}$ ,  $a_{ng}$ , 4500 to 9500 feet altitude

Figure 22.- Continued.



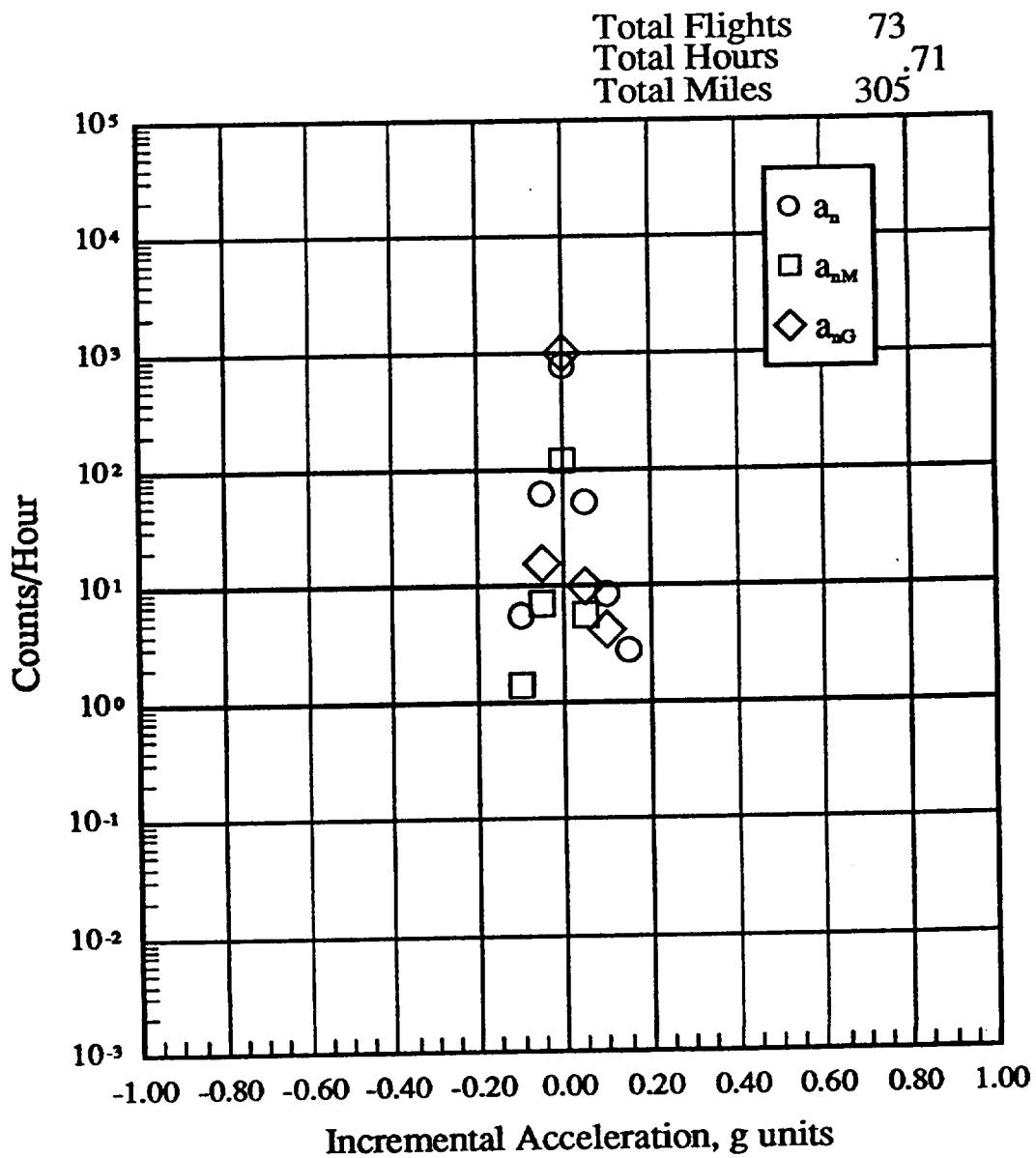
(f)  $a_n$ ,  $a_{nM}$ ,  $a_{nG}$ , 9500 to 14500 feet altitude

Figure 22.- Continued.



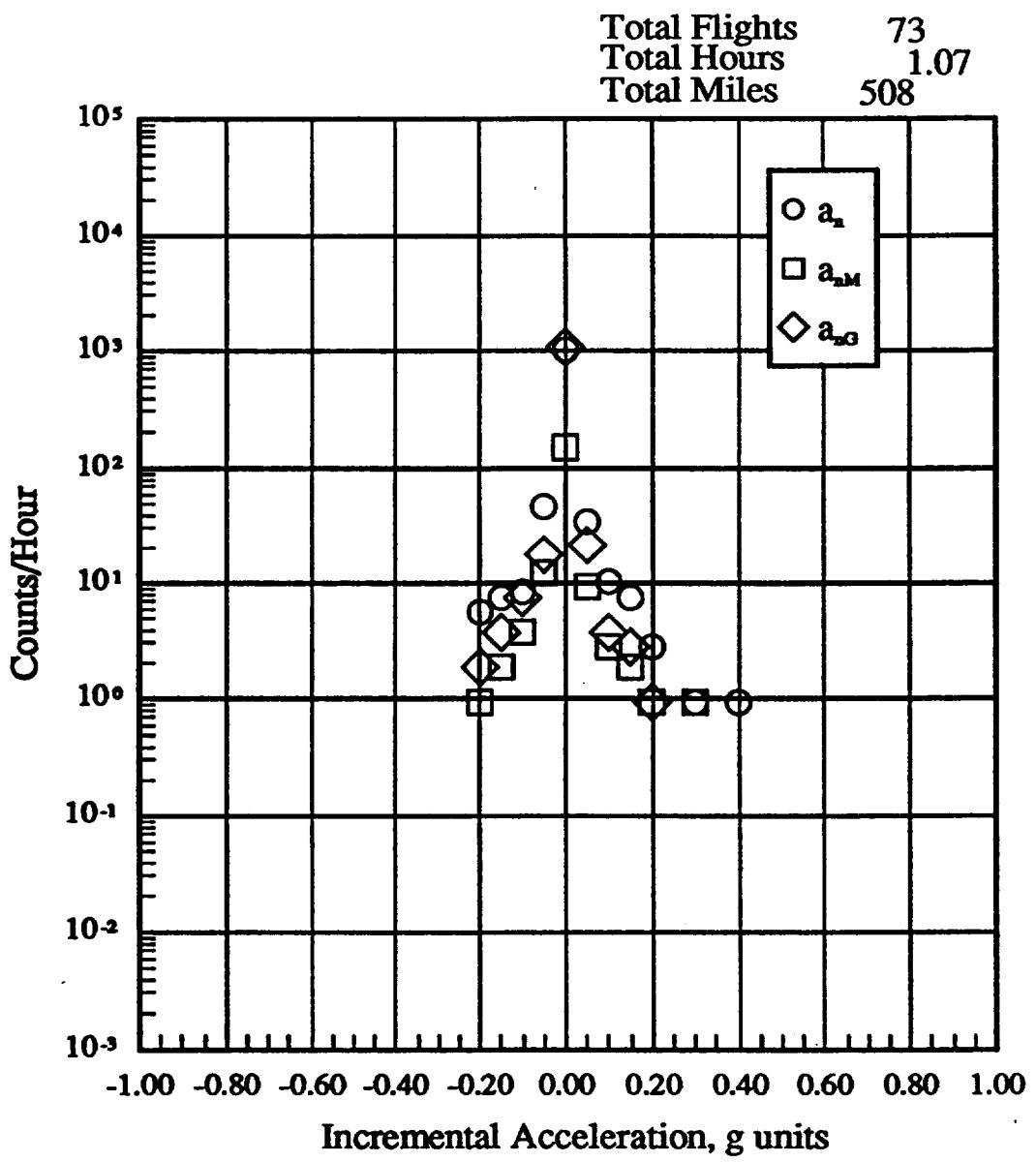
(g)  $a_n$ ,  $a_{nM}$ ,  $a_{nG}$ , 14500 to 19500 feet altitude

Figure 22.- Continued.



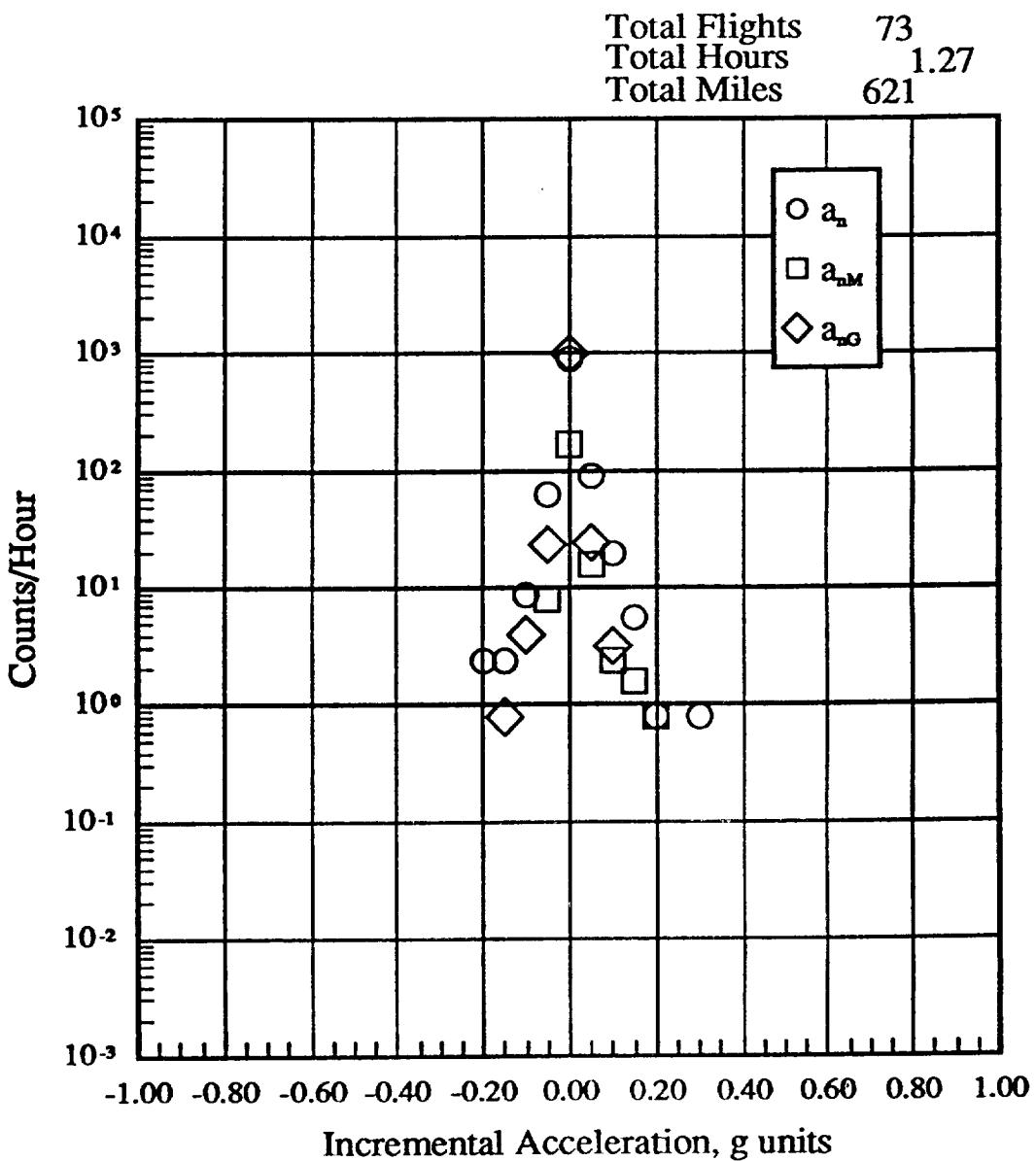
(h)  $a_n$ ,  $a_{nM}$ ,  $a_{nG}$ , 19500 to 24500 feet altitude

Figure 22.- Continued.



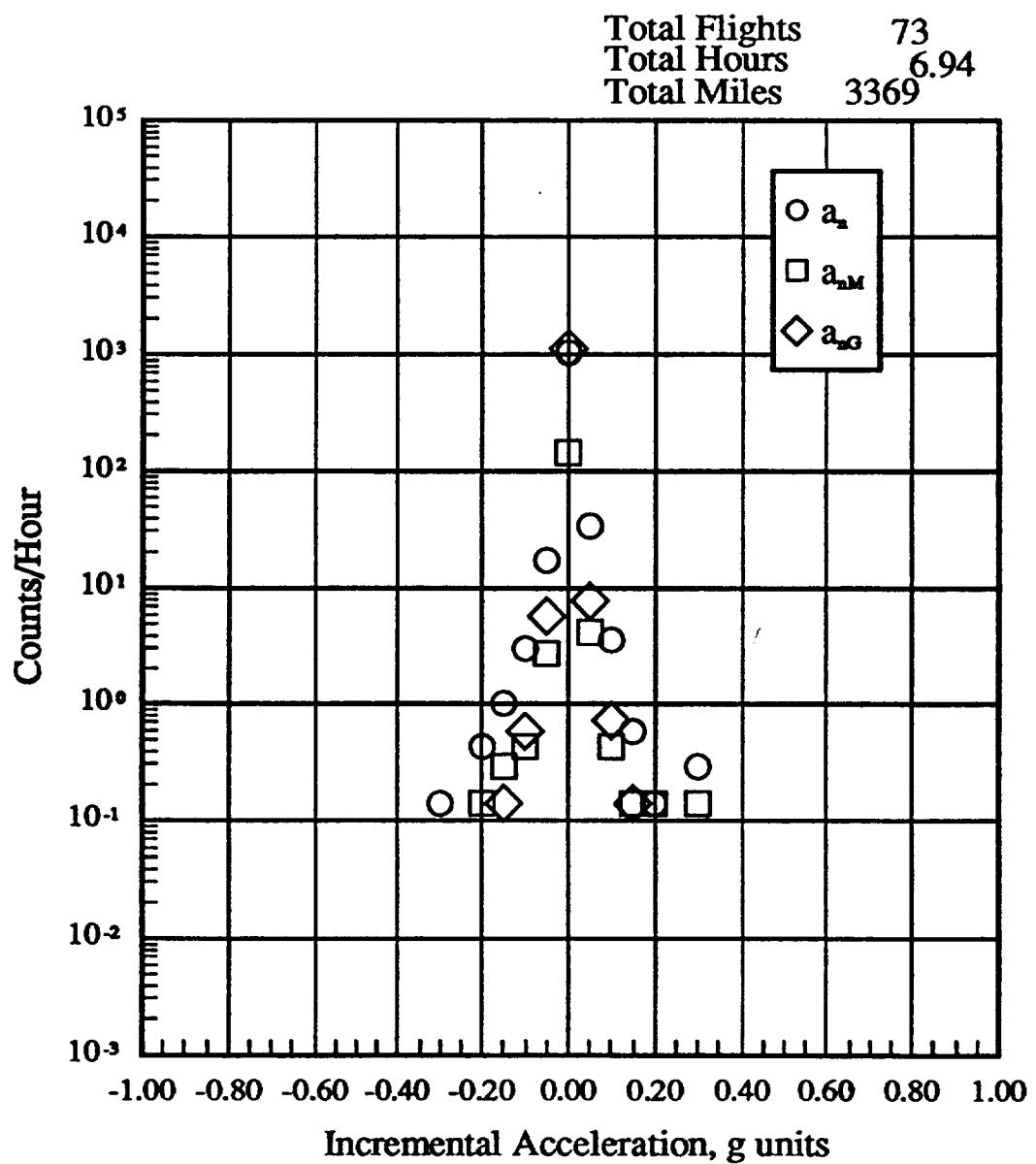
(i)  $a_n$ ,  $a_{nM}$ ,  $a_{nG}$ , 24500 to 29500 feet altitude

Figure 22.- Continued.



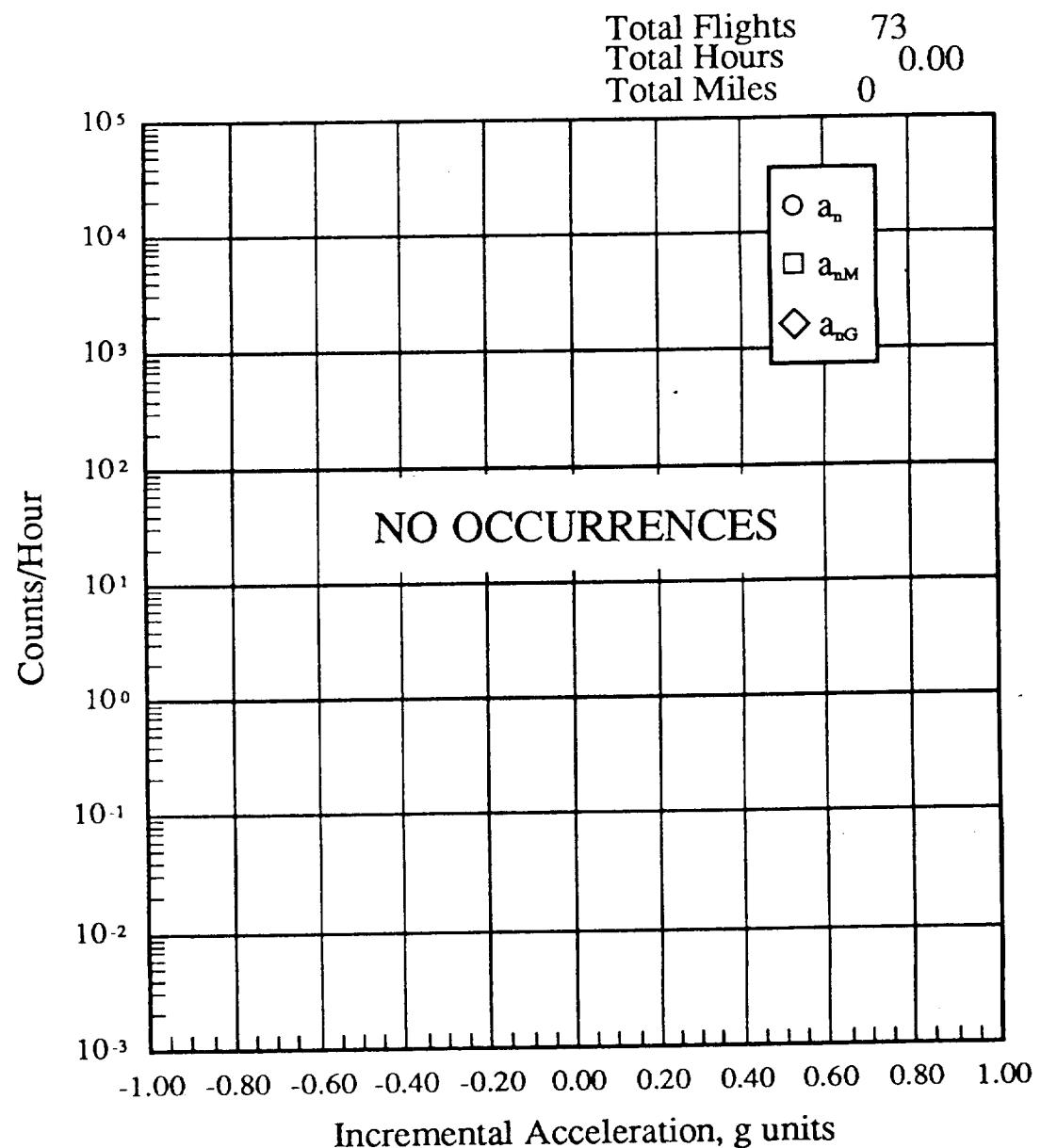
(j)  $a_n$ ,  $a_{nM}$ ,  $a_{nG}$ , 29500 to 34500 feet altitude

Figure 22.- Continued.



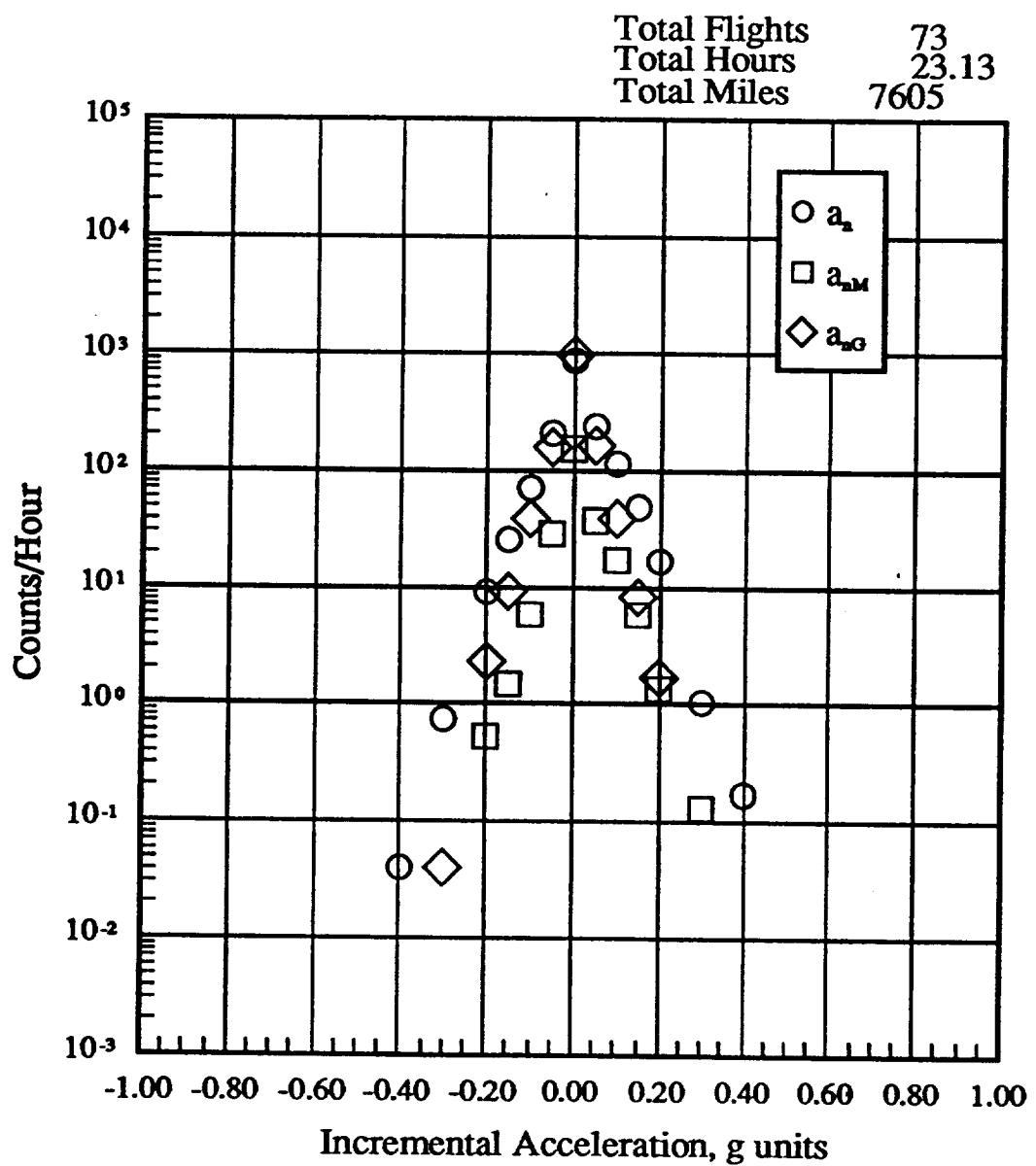
(k)  $a_n$ ,  $a_{nM}$ ,  $a_{nG}$ , 34500 to 39500 feet altitude

Figure 22.- Continued.



(l)  $a_n$ ,  $a_{nM}$ ,  $a_{nG}$ , 39500 to 44500 feet altitude

Figure 22.- Continued.



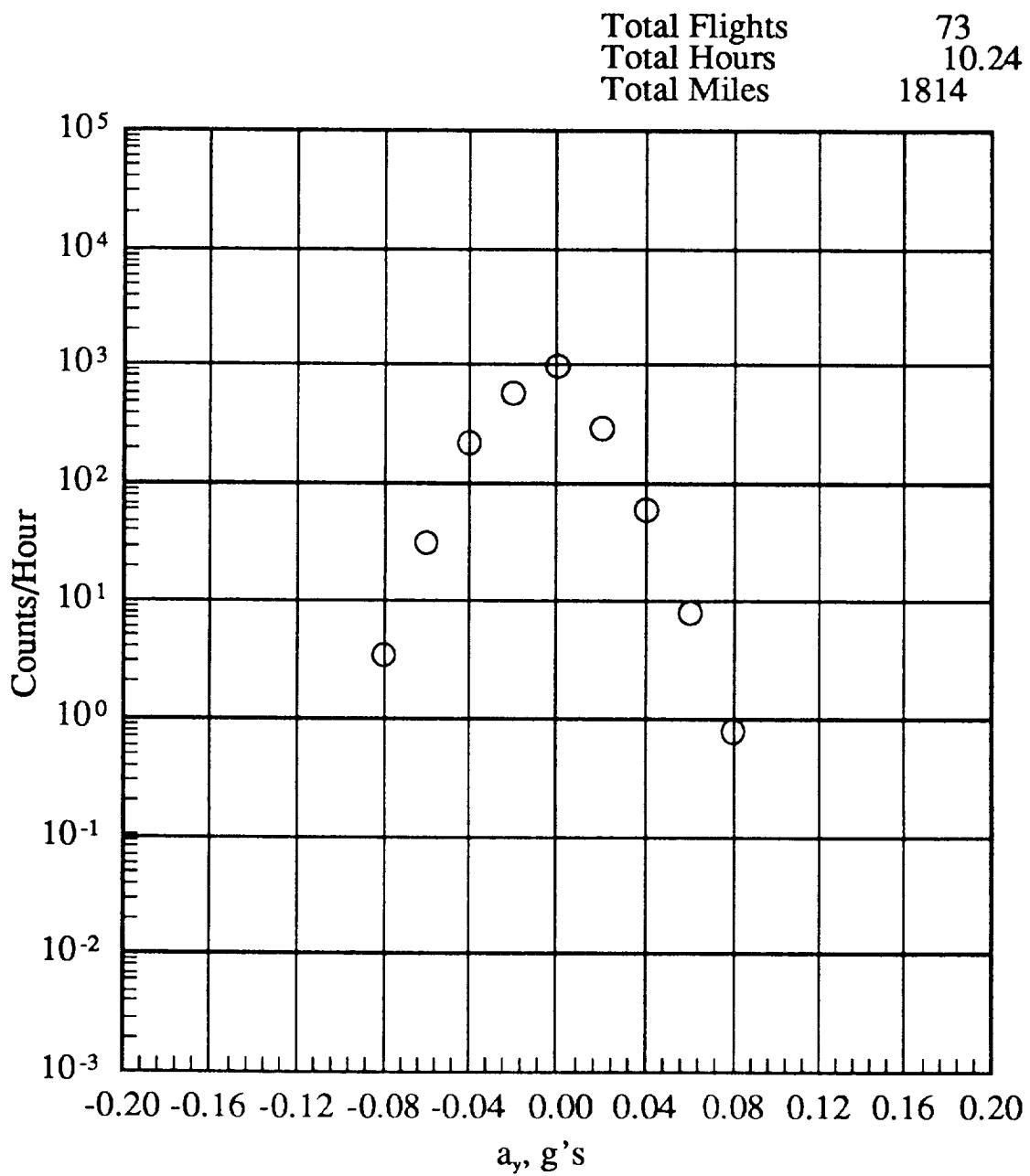
(m)  $a_n$ ,  $a_{nM}$ ,  $a_{nG}$ , -500 to 44500 feet altitude

Figure 22.- Continued.

LEVEL $a_y$	PRESSURE ALTITUDE BANDS										TOTAL FLIGHTS 73	TOTAL FLIGHT HOURS 23.19	TOTAL FLIGHT MILES 7604.77
	-500 TO 4500 FT	4500 TO 9500 FT	9500 TO 14500 FT	14500 TO 19500 FT	19500 TO 24500 FT	24500 TO 29500 FT	29500 TO 34500 FT	34500 TO 39500 FT	39500 TO 44500 FT	-500 TO 44500 FT			
g's	0	0	0	0	0	0	0	0	0	0	0	0	0
.48	0	0	0	0	0	0	0	0	0	0	0	0	0
.44	0	0	0	0	0	0	0	0	0	0	0	0	0
.40	0	0	0	0	0	0	0	0	0	0	0	0	0
.36	0	0	0	0	0	0	0	0	0	0	0	0	0
.32	0	0	0	0	0	0	0	0	0	0	0	0	0
.28	0	0	0	0	0	0	0	0	0	0	0	0	0
.24	0	0	0	0	0	0	0	0	0	0	0	0	0
.20	0	0	0	0	0	0	0	0	0	0	0	0	0
.16	0	0	0	0	0	0	0	0	0	0	0	0	0
.12	0	0	0	0	0	0	0	0	0	0	0	0	0.34
.08	0.78	0	0	0	0	0	0	0	0	0	0	0	3.75
.06	7.91	5.73	0	0	0	0	0.93	0.79	0	0	0	0	28.42
.04	60.77	26.76	4.86	0	1.41	5.61	25.98	8.36	0	0	0	0	141.82
.02	294.37	100.35	45.35	13.22	12.65	1054.21	906.30	1299.87	0	0	0	0	1032.34
0	994.59	731.09	660.07	574.30	743.33	21.50	40.16	13.83	0	0	0	0	276.75
-.02	582.88	97.48	69.65	99.88	36.53	0.93	3.15	0.43	0	0	0	0	99.48
-.04	222.07	17.20	1.62	7.34	1.41	0	0	0	0	0	0	0	13.88
-.06	31.46	0	0	0	0	0	0	0	0	0	0	0	1.51
-.08	3.42	0	0	0	0	0	0	0	0	0	0	0	0
-.12	0	0	0	0	0	0	0	0	0	0	0	0	0
-.16	0	0	0	0	0	0	0	0	0	0	0	0	0
-.20	0	0	0	0	0	0	0	0	0	0	0	0	0
-.24	0	0	0	0	0	0	0	0	0	0	0	0	0
-.28	0	0	0	0	0	0	0	0	0	0	0	0	0
-.32	0	0	0	0	0	0	0	0	0	0	0	0	0
-.36	0	0	0	0	0	0	0	0	0	0	0	0	0
-.40	0	0	0	0	0	0	0	0	0	0	0	0	0
-.44	0	0	0	0	0	0	0	0	0	0	0	0	0
-.48	0	0	0	0	0	0	0	0	0	0	0	0	0
FLIGHT HOURS @ ALT	10.24	1.05	1.23	0.68	0.71	1.07	1.27	6.94	0	23.19			
FLIGHT HOURS @ ALT	1814.48	278.29	435.09	273.62	305.17	508.15	620.66	3369.31	0	7604.77			

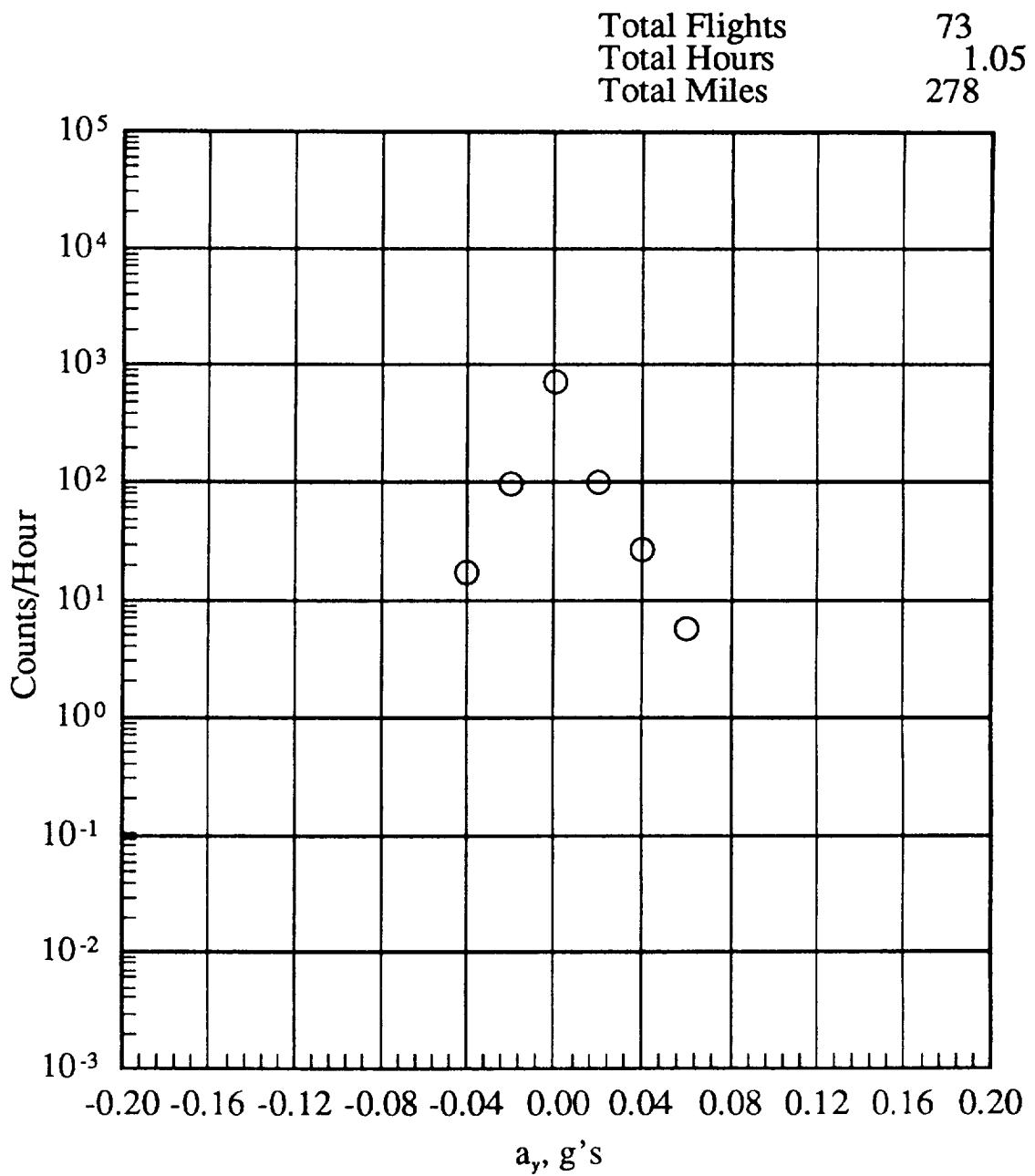
(a)  $a_y$  Level crossing counts per hour within pressure altitude bands

Figure 23.- Lateral acceleration exceedances: Non-revenue flights.



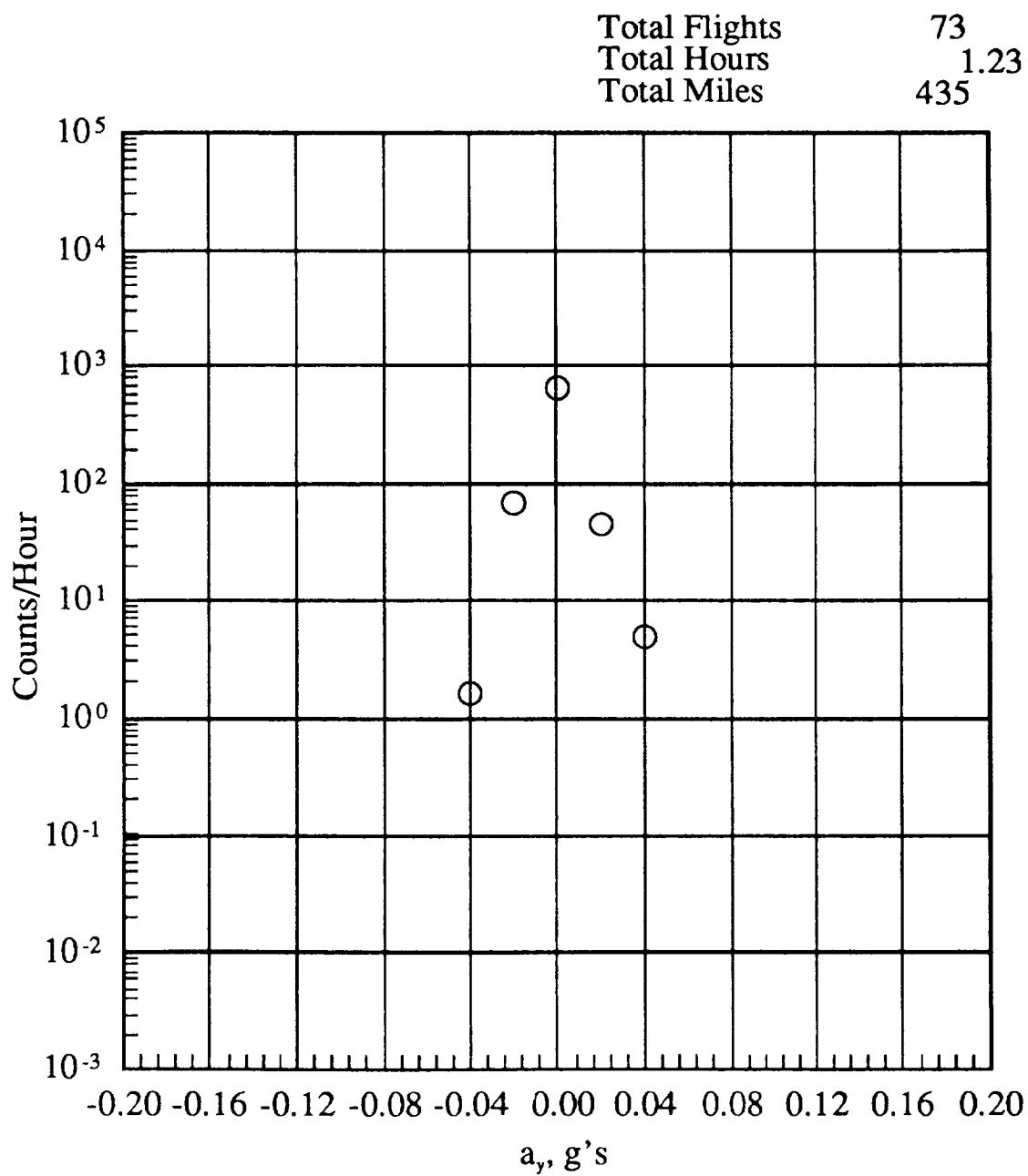
(b) -500 to 4500 feet altitude

Figure 23.- Continued.



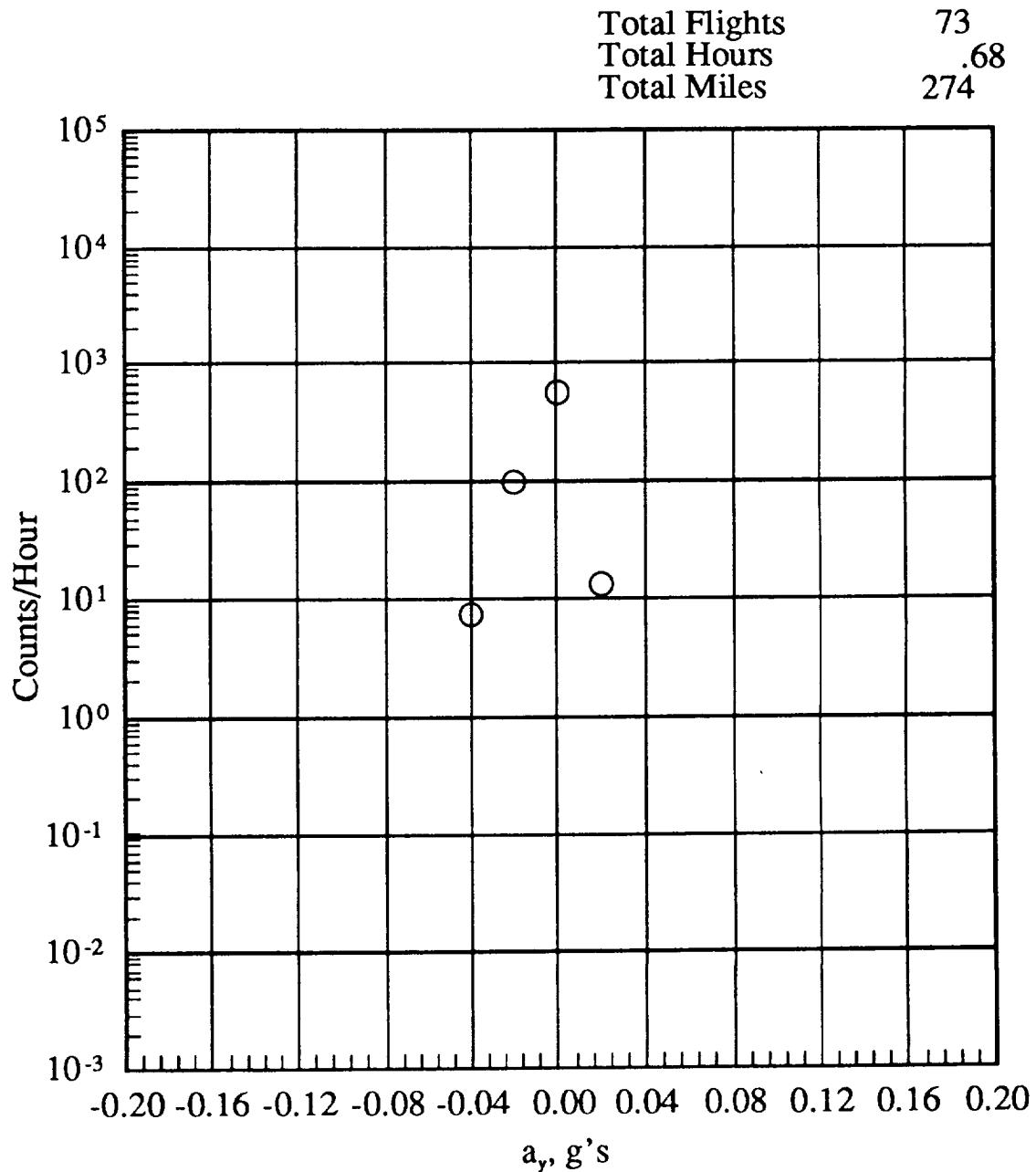
(c) 4500 to 9500 feet altitude

Figure 23.- Continued.



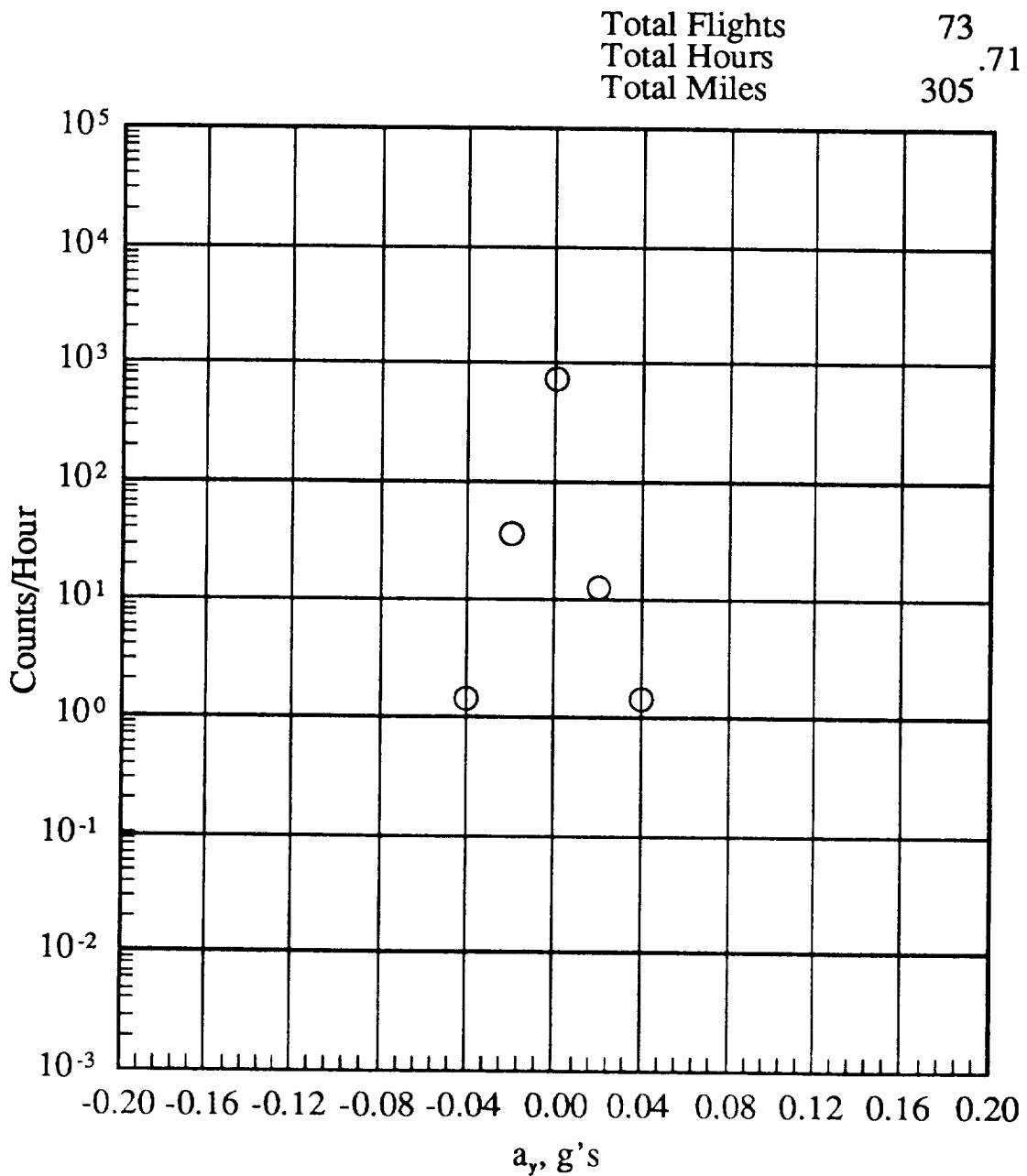
(d) 9500 to 14500 altitude

Figure 23.- Continued.



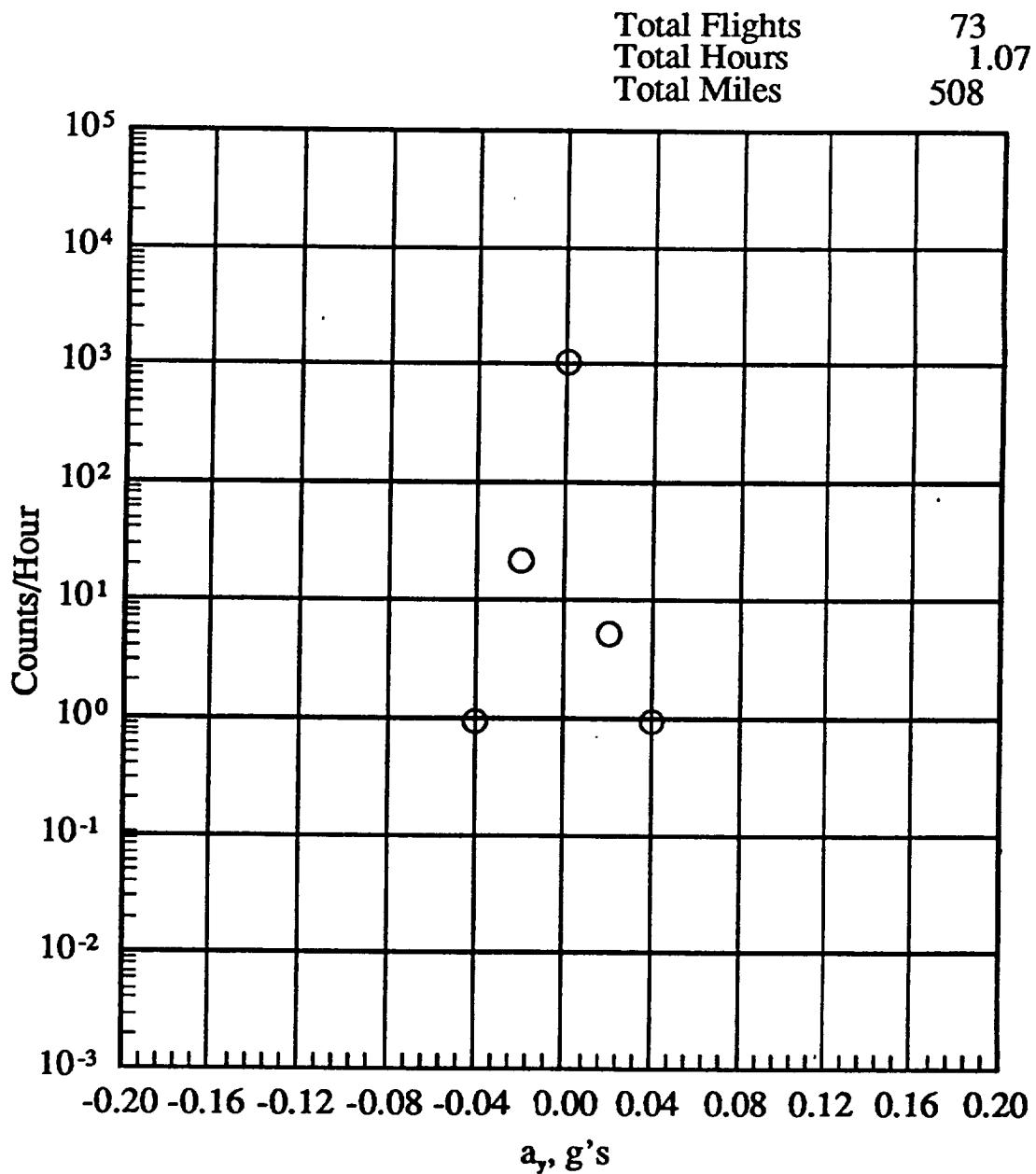
(e) 14500 to 19500 feet altitude

Figure 23.- Continued.



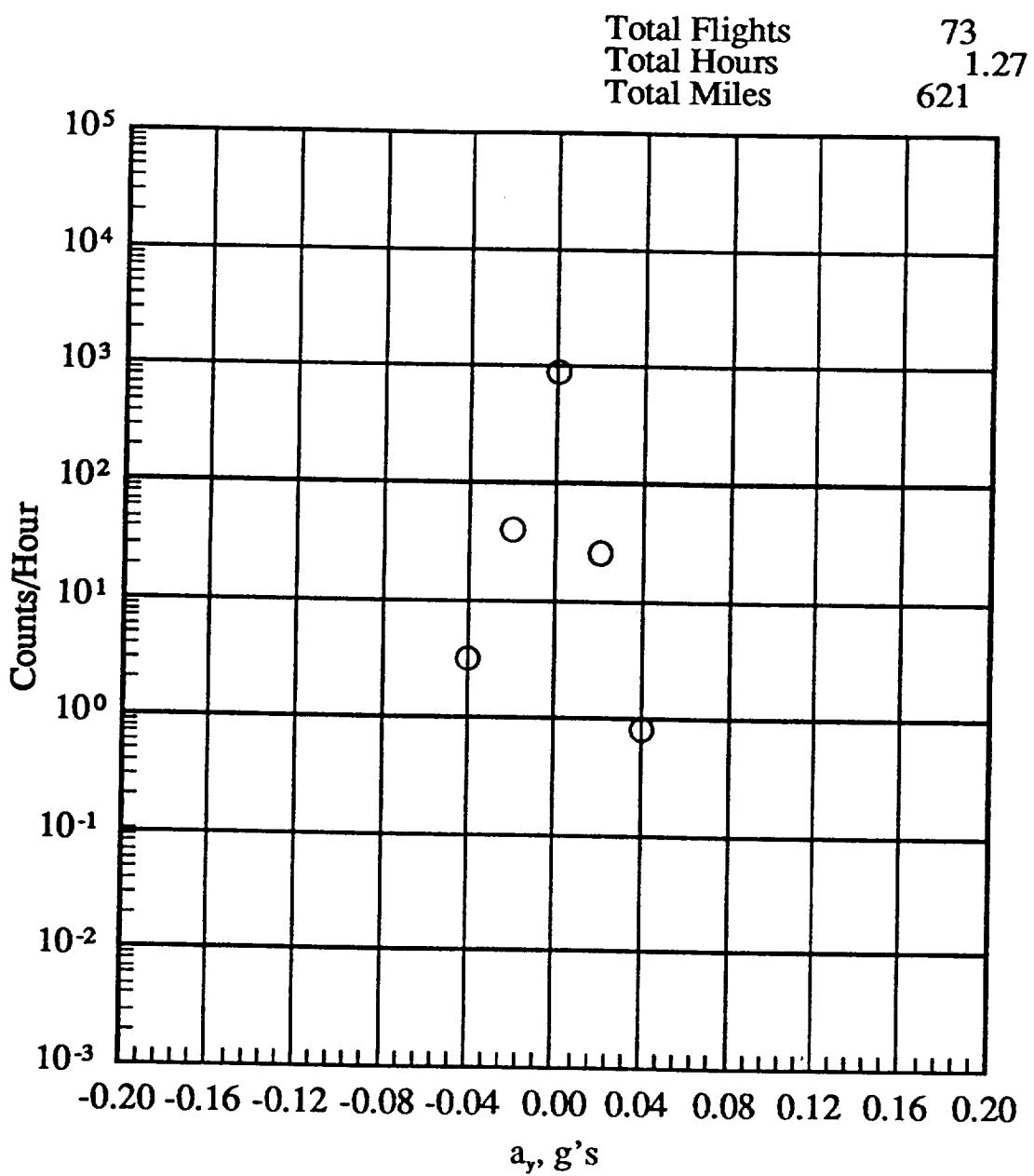
(f) 19500 to 24500 feet altitude

Figure 23.- Continued.



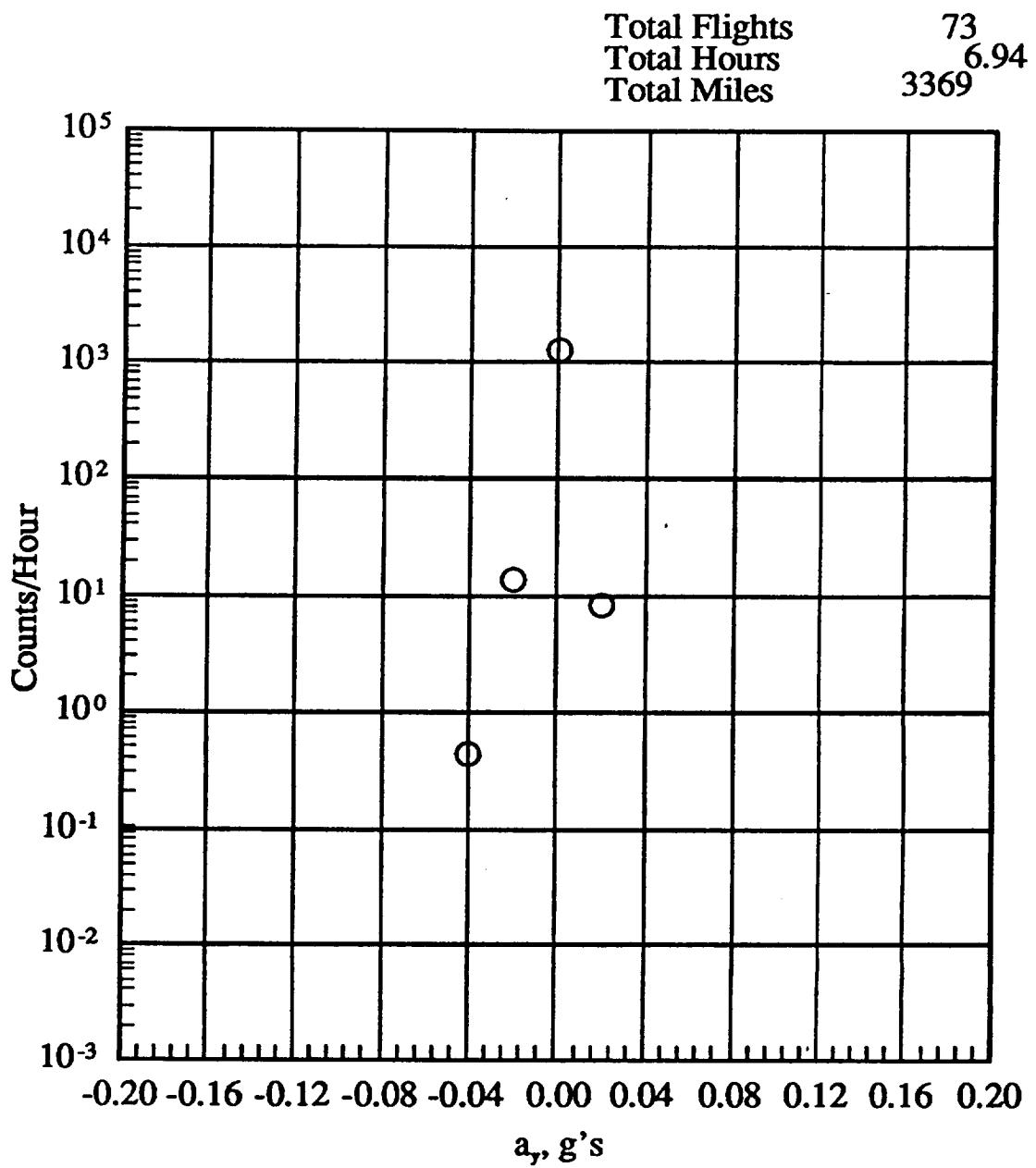
(g) 24500 to 29500 feet altitude

Figure 23.- Continued.



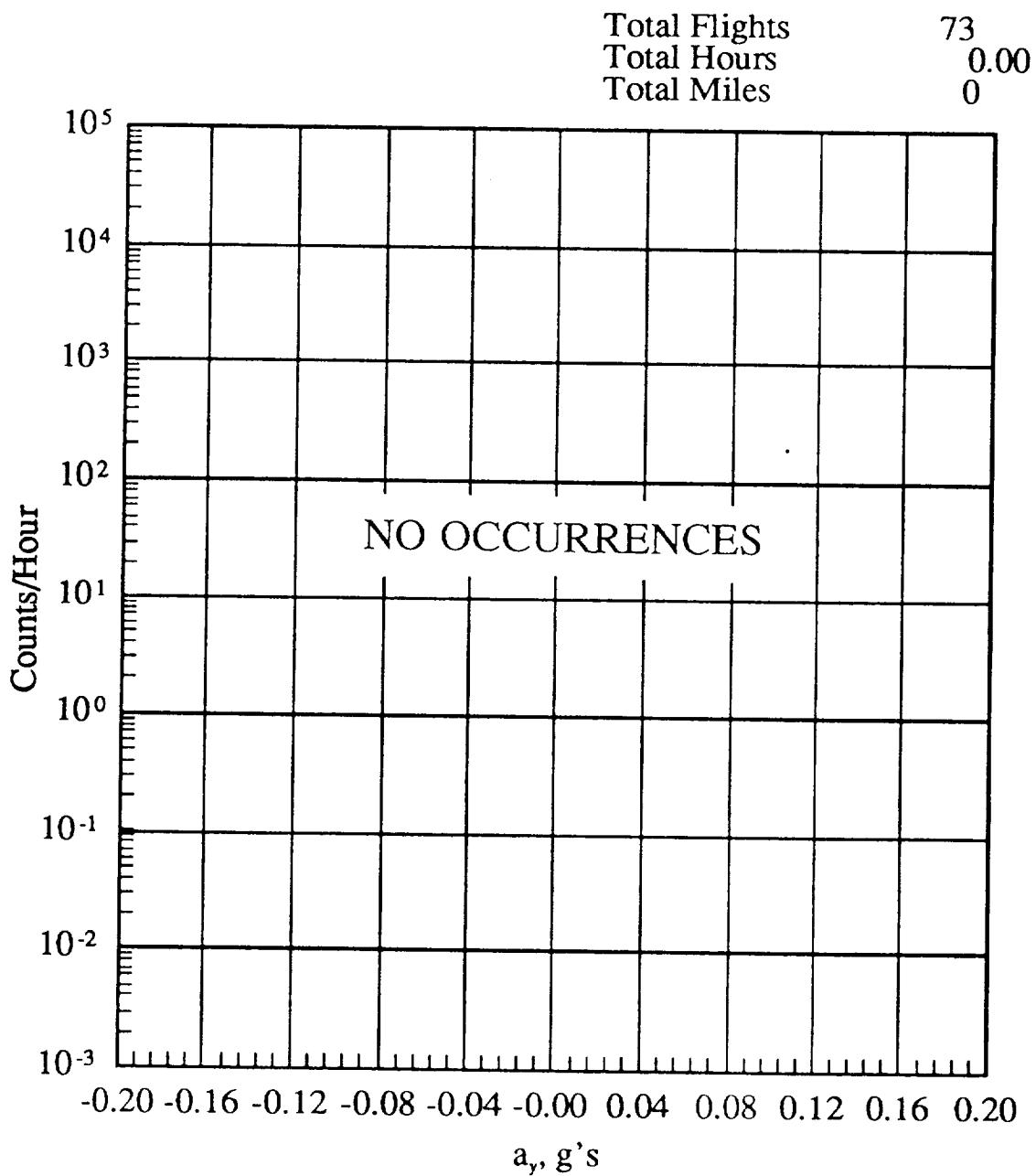
(h) 29500 to 34500 feet altitude

Figure 23.- Continued.



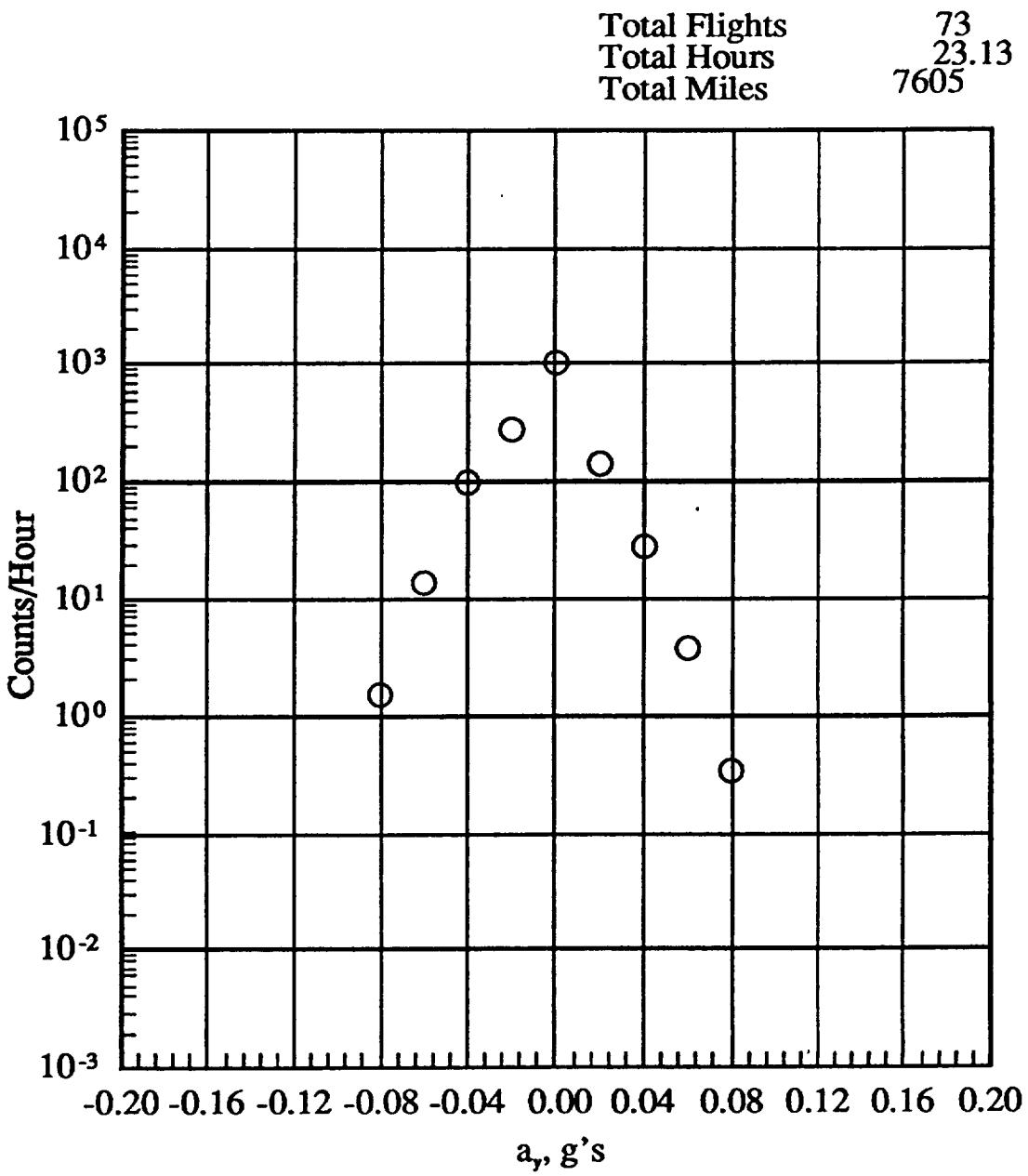
(i) 34500 to 39500 feet altitude

Figure 23.- Continued.



(j) 39500 to 44500 feet altitude

Figure 23.- Continued.



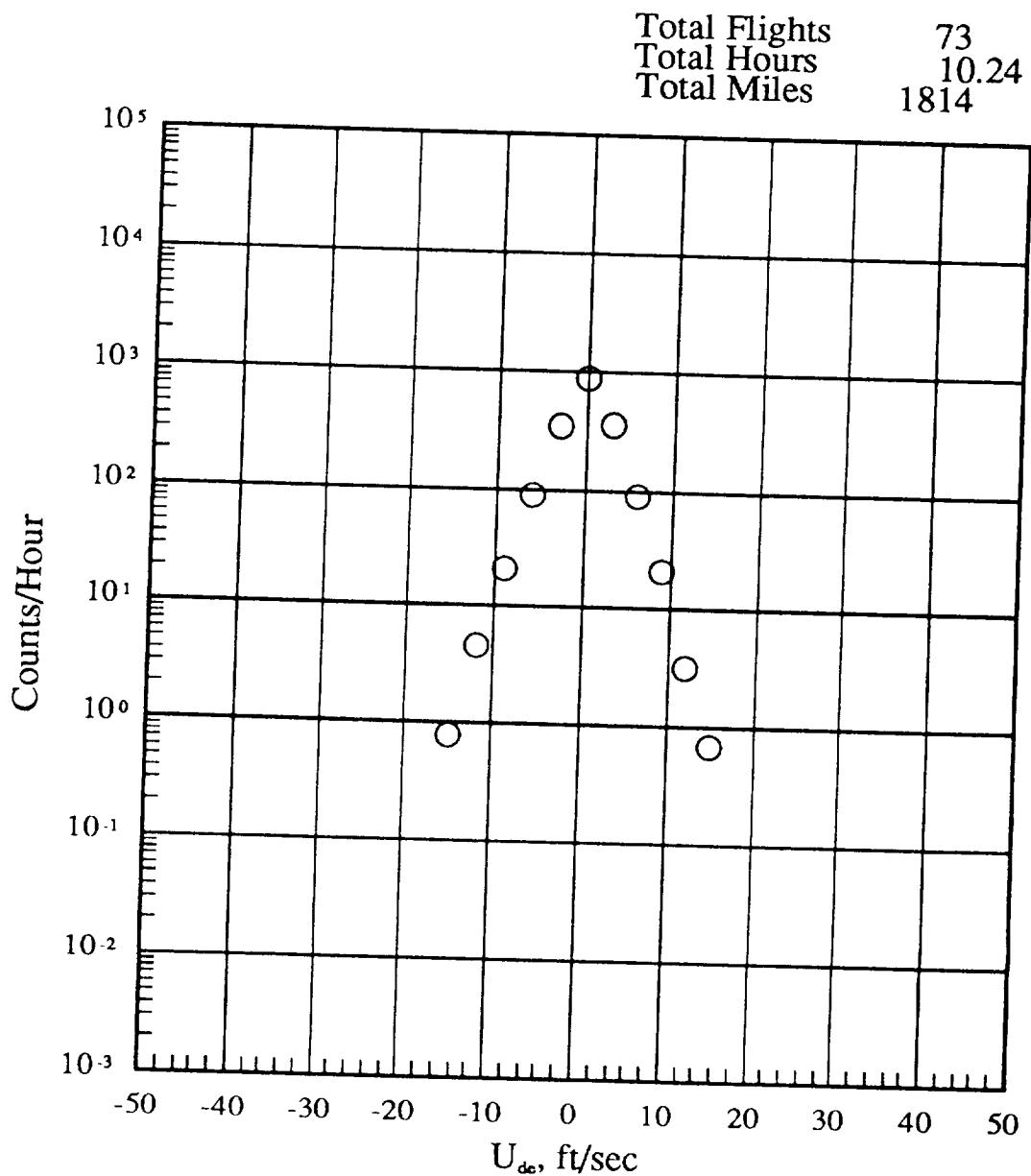
(k) -500 to 44500 feet altitude

Figure 23.- Concluded.

		PRESSURE ALTITUDE BANDS											
		-500 TO 4500 FT	4500 TO 9500 FT	9500 TO 14500 FT	14500 TO 19500 FT	19500 TO 24500 FT	24500 TO 29500 FT	29500 TO 34500 FT	34500 TO 39500 FT	39500 TO 44500 FT	-500 TO 44500 FT		
U <sub>de</sub> FT/SEC												TOTAL FLIGHTS	
100	0	0	0	0	0	0	0	0	0	0	0	0	0
90	0	0	0	0	0	0	0	0	0	0	0	0	0
80	0	0	0	0	0	0	0	0	0	0	0	0	0
70	0	0	0	0	0	0	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0.68	0	0	0	0	0	0	0	0	0	0	0	0.30
12	3.13	0	0	0	0	0	0	0	0	0	0	0	1.38
9	20.81	0	2.43	0	0	0	0	0	0	0	0	0	9.31
6	90.96	4.78	3.24	0	0	1.87	0	0	0	0.14	0	0	40.66
3	364.81	38.23	12.96	0	4.22	8.41	4.72	2.45	0	0	0	0	164.93
0	880.96	820.92	888.46	987.03	1001.87	1074.77	981.89	1122.45	0	0	0	0	972.23
-3	352.60	31.54	9.72	1.47	0	9.35	6.30	1.30	0	0	0	0	158.77
-6	90.18	0.96	5.67	0	0	2.80	0.79	0	0.14	0	0	0	40.36
-9	20.91	0	0.81	0	0	0.93	0	0	0	0	0	0	9.31
-12	4.49	0	0	0	0	0	0	0	0	0	0	0	1.98
-15	0.78	0	0	0	0	0	0	0	0	0	0	0	0.34
-20	0	0	0	0	0	0	0	0	0	0	0	0	0
-30	0	0	0	0	0	0	0	0	0	0	0	0	0
-40	0	0	0	0	0	0	0	0	0	0	0	0	0
-50	0	0	0	0	0	0	0	0	0	0	0	0	0
-60	0	0	0	0	0	0	0	0	0	0	0	0	0
-70	0	0	0	0	0	0	0	0	0	0	0	0	0
-80	0	0	0	0	0	0	0	0	0	0	0	0	0
-90	0	0	0	0	0	0	0	0	0	0	0	0	0
-100	0	0	0	0	0	0	0	0	0	0	0	0	0
FLIGHT HOURS @ ALT	10.24	1.05	1.23	0.68	0.71	1.07	1.27	6.94	0	23.19	0	0	
FLIGHT MILES @ ALT	1814.48	278.29	435.09	273.62	305.17	508.15	620.66	3369.31	0	7604.77	0	0	73
TOTAL FLIGHTS													
TOTAL FLIGHT HOURS FLAPS UP AND DOWN												23.19	
TOTAL FLIGHT MILES FLAPS UP AND DOWN												7604.77	

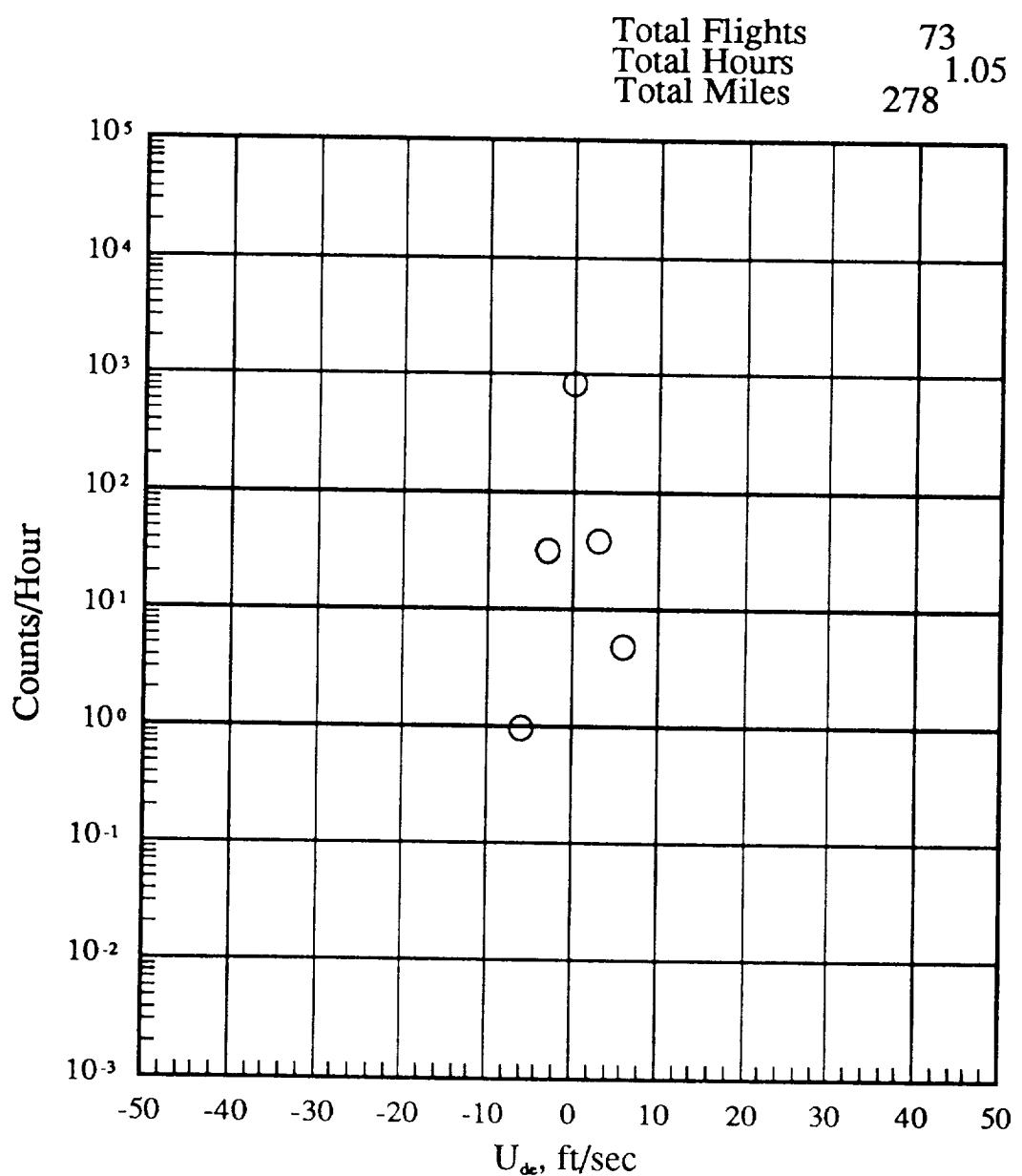
(a) U<sub>de</sub> Level exceedances: Non-revenue flights.

Figure 24.- U<sub>de</sub> exceedances: Non-revenue flights.



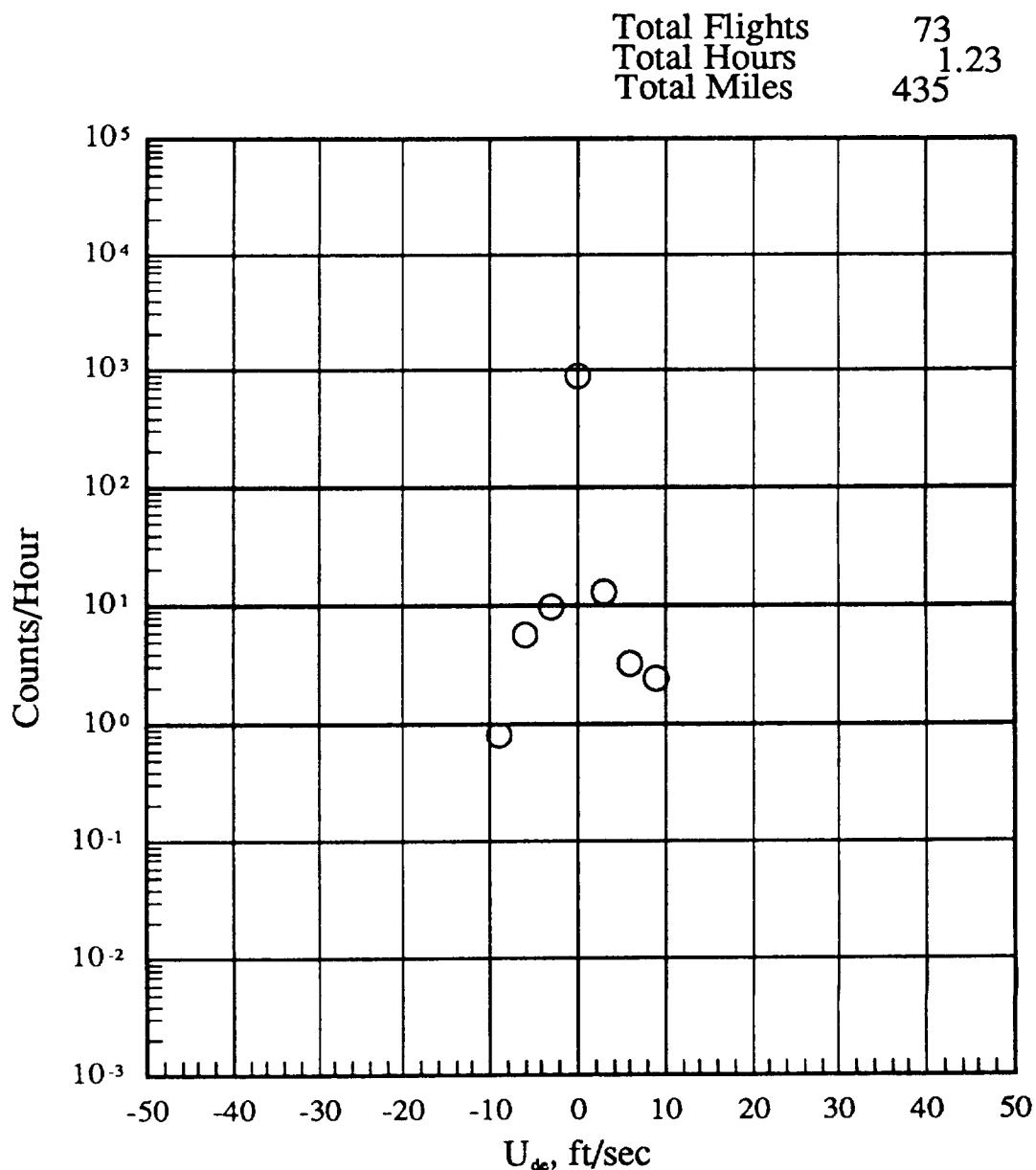
(b) -500 to 4500 feet altitude

Figure 24.- Continued.



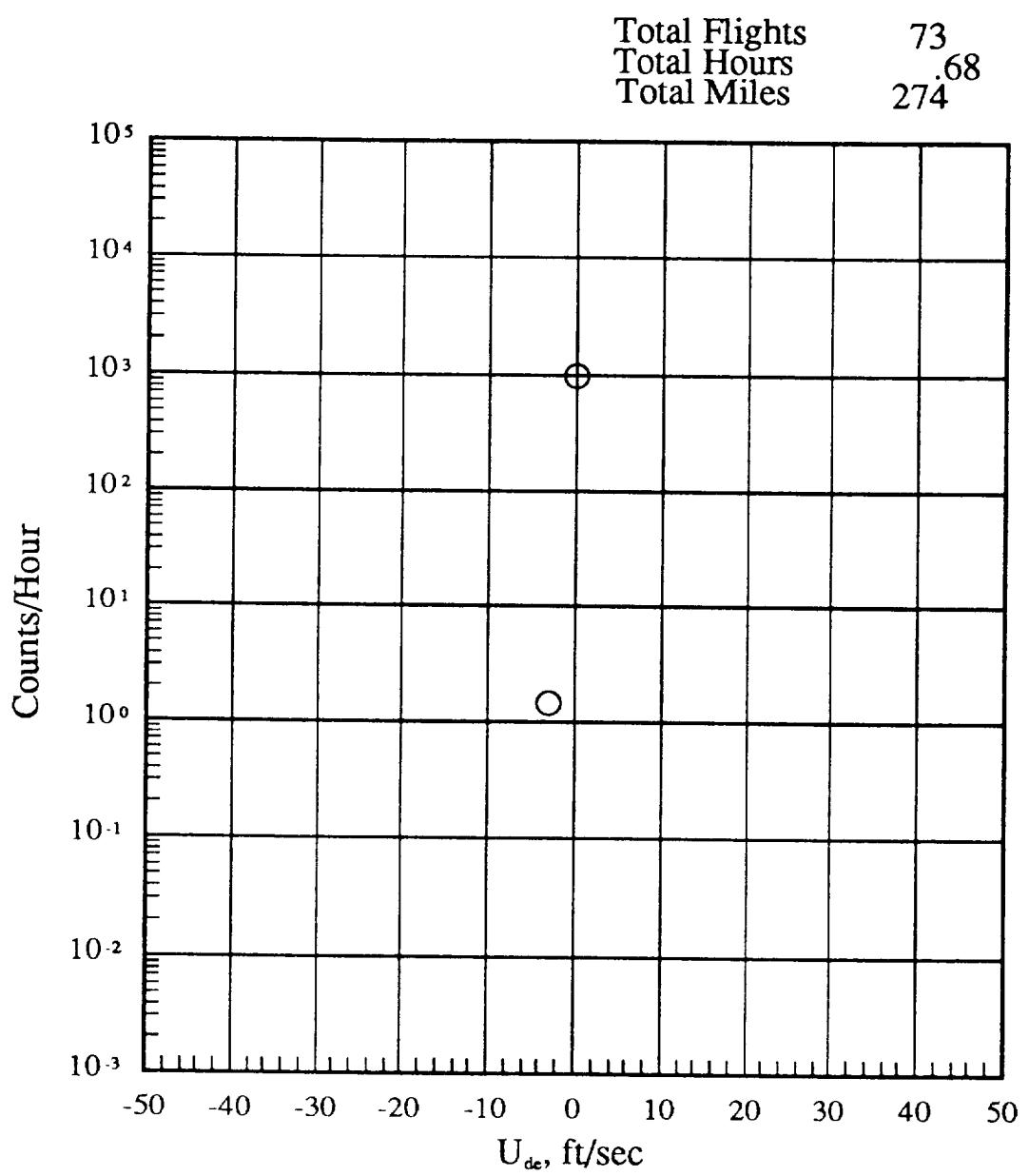
(c) 4500 to 9500 feet altitude

Figure 24.- Continued.



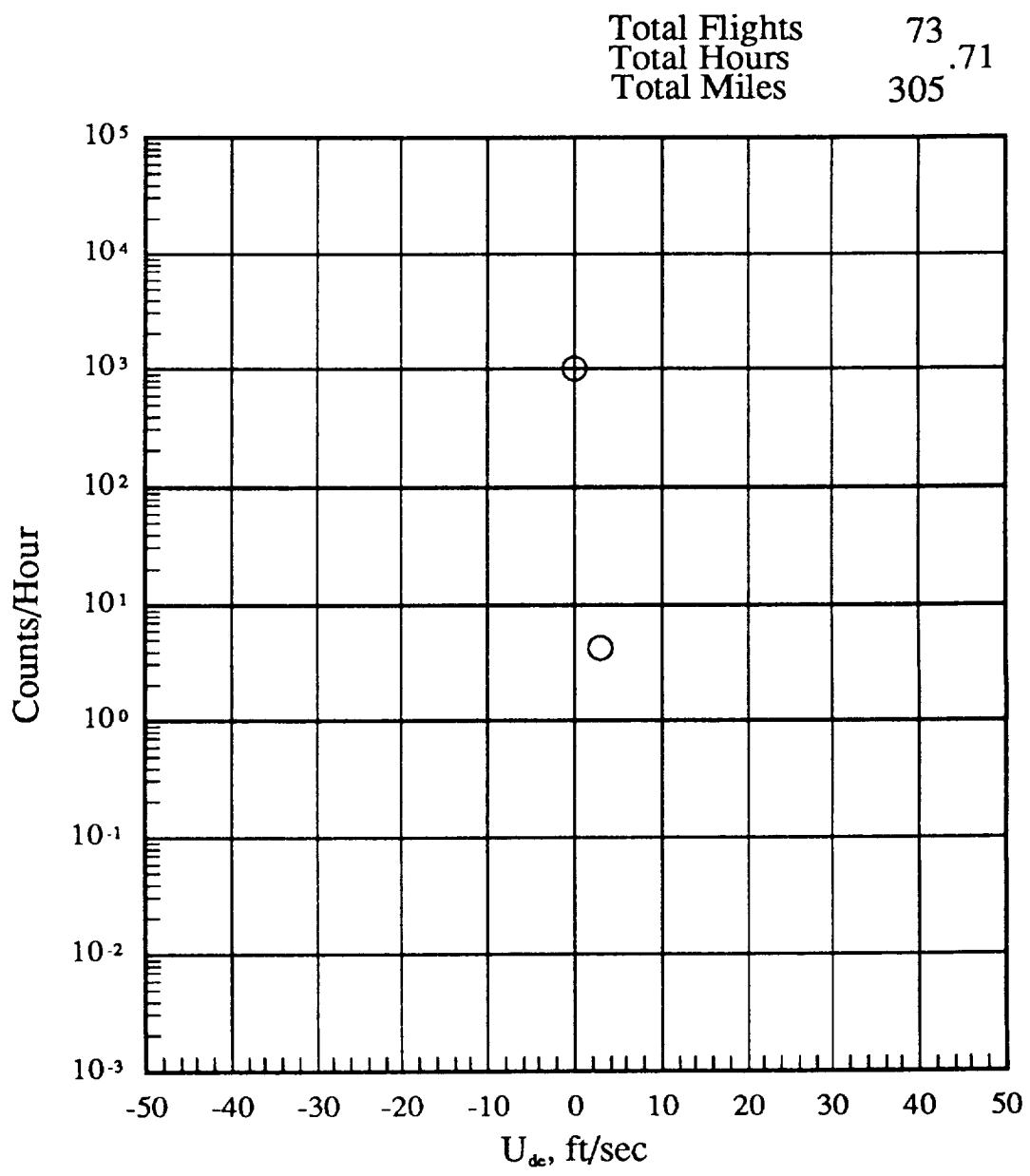
(d) 9500 to 14500 feet altitude

Figure 24.- Continued.



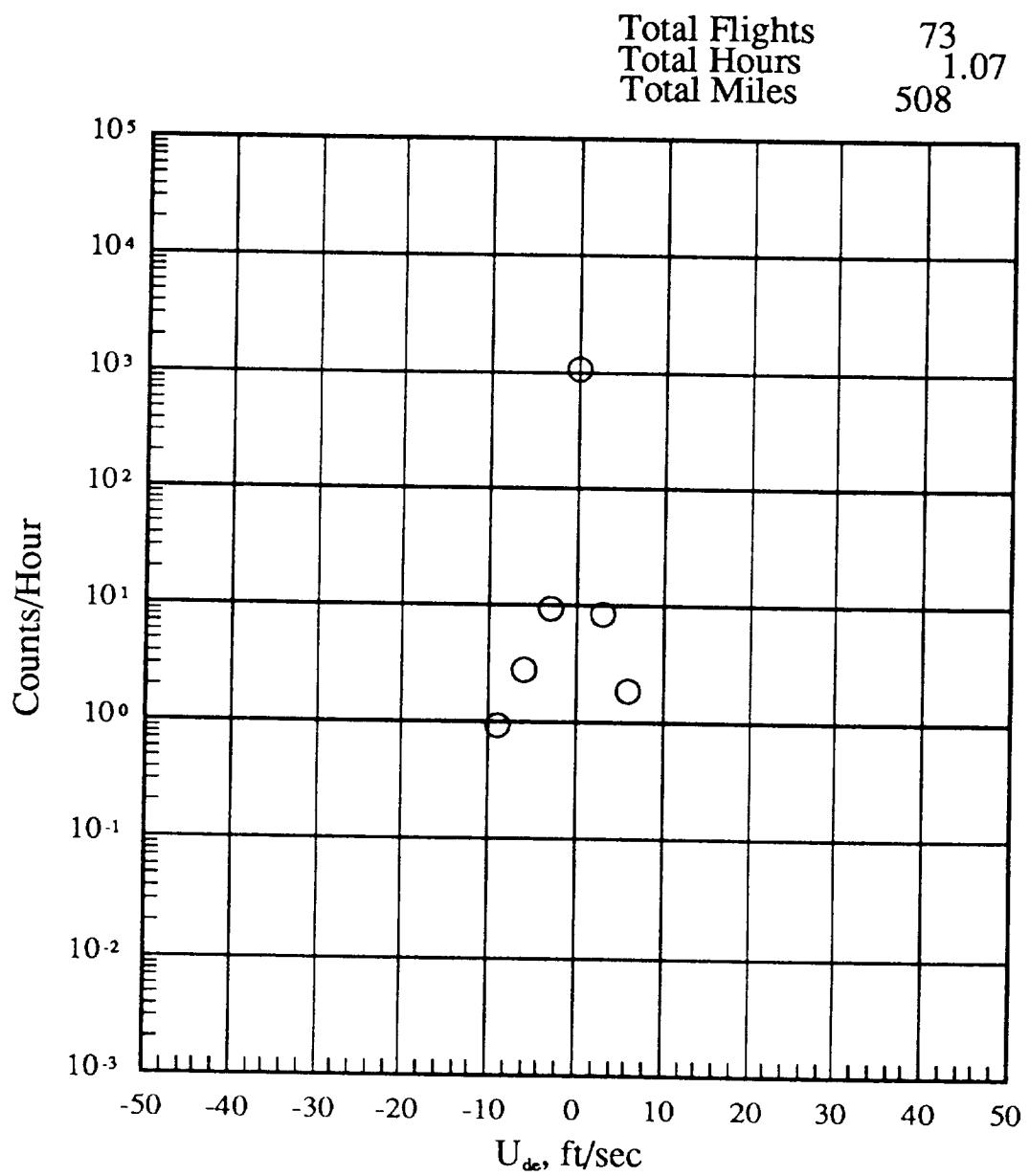
(e) 14500 to 19500 feet altitude

Figure 24.- Continued.



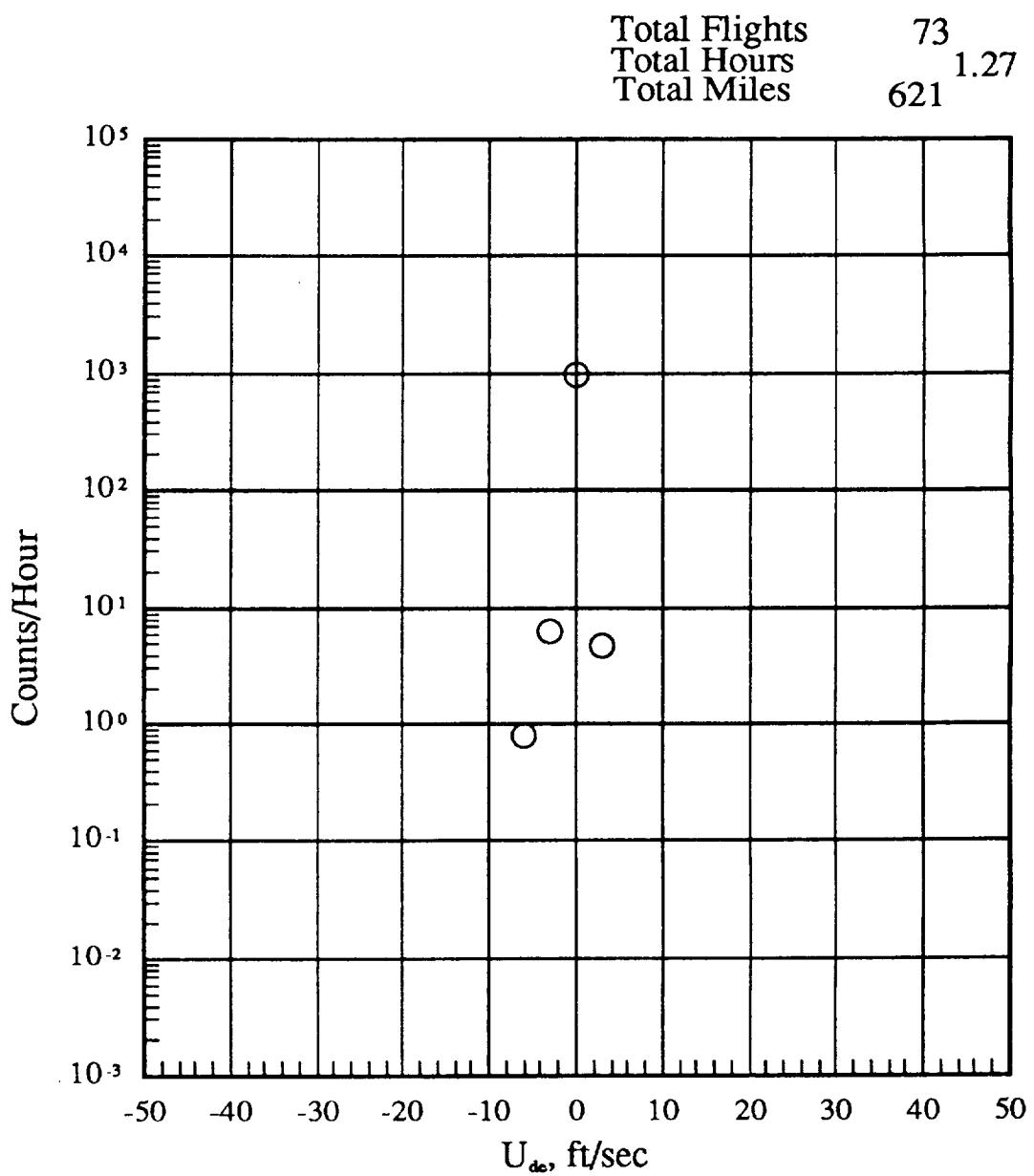
(f) 19500 to 24500 feet altitude

Figure 24.- Continued.



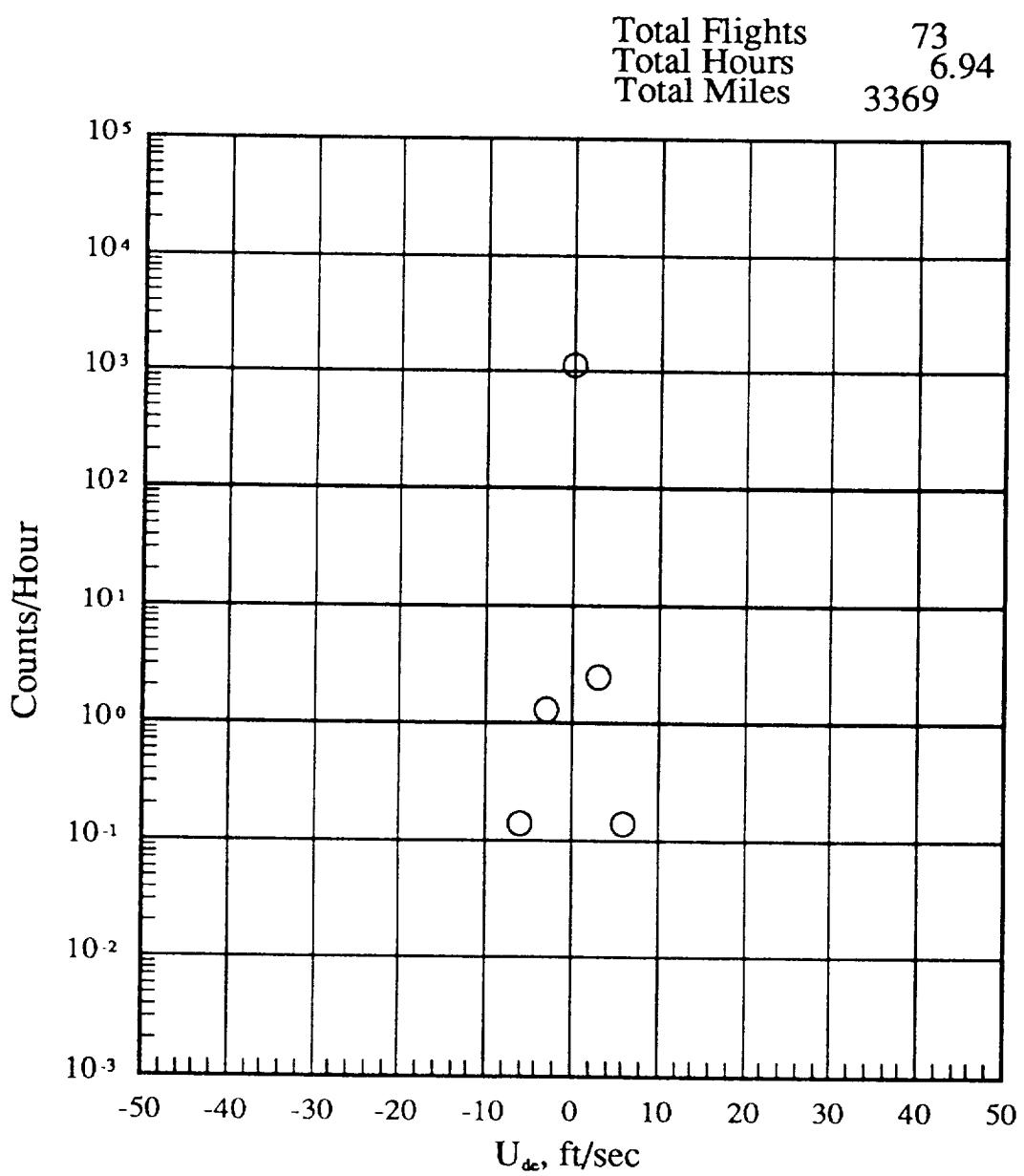
(g) 24500 to 29500 feet altitude

Figure 24.- Continued.



(h) 29500 to 34500 feet altitude

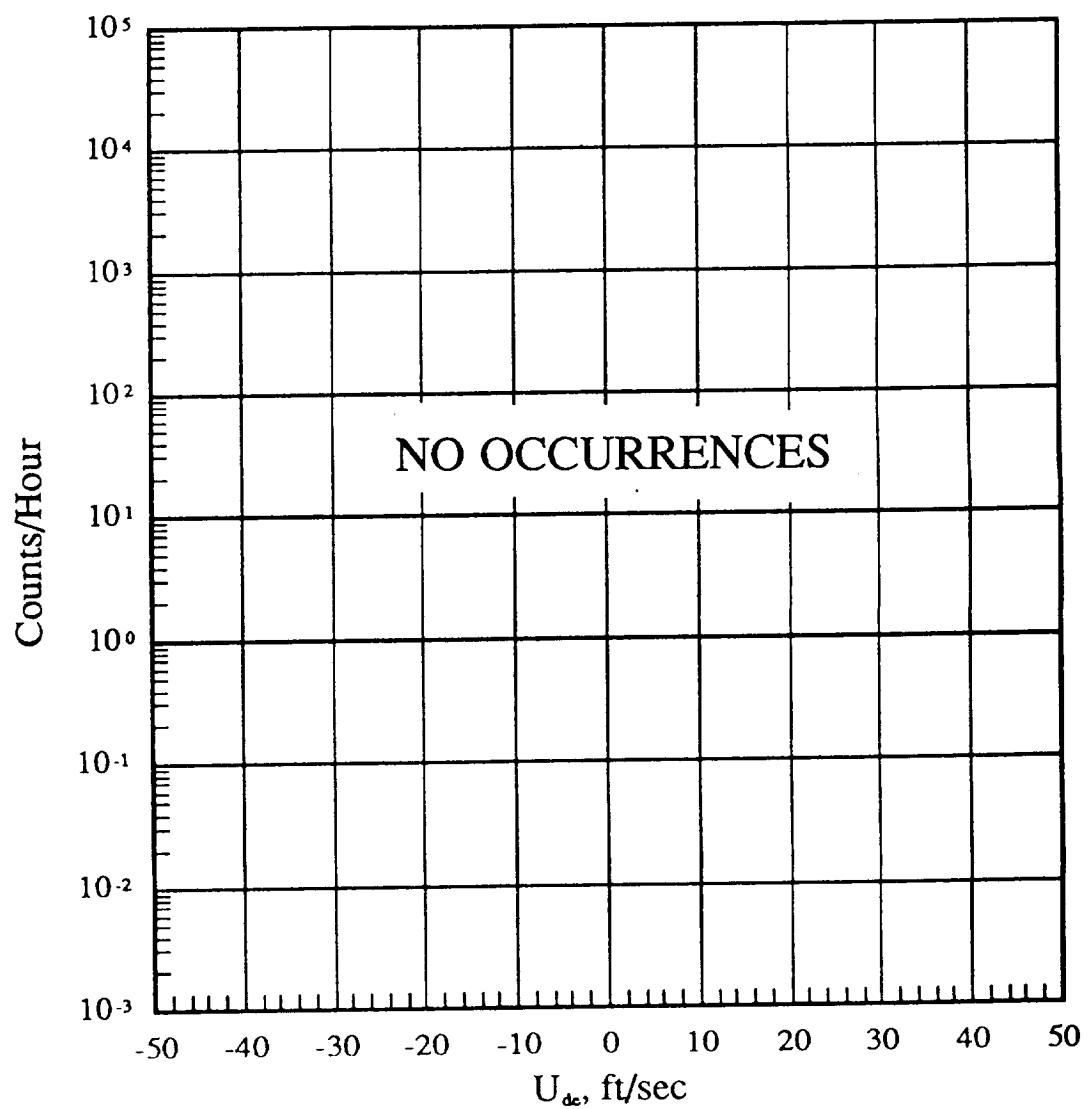
Figure 24.- Continued.



(i) 34500 to 39500 feet altitude

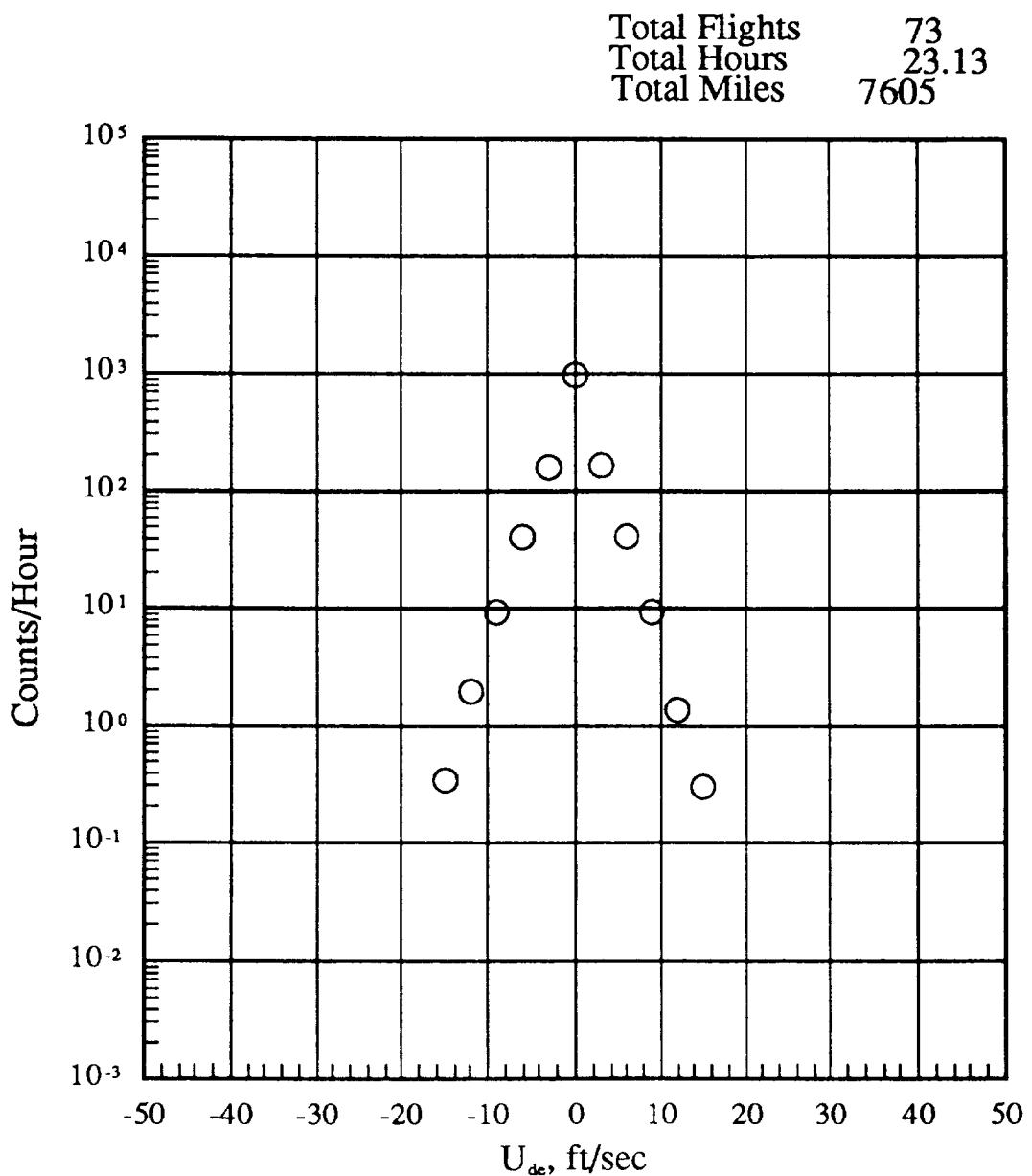
Figure 24.- Continued.

Total Flights	73
Total Hours	0.00
Total Miles	0



(j) 39500 to 44500 feet altitude

Figure 24.- Continued.



(k) -500 to 44500 feet altitude

Figure 24.- Concluded.

DATA FROM 247 HOURS & 70 FLIGHTS

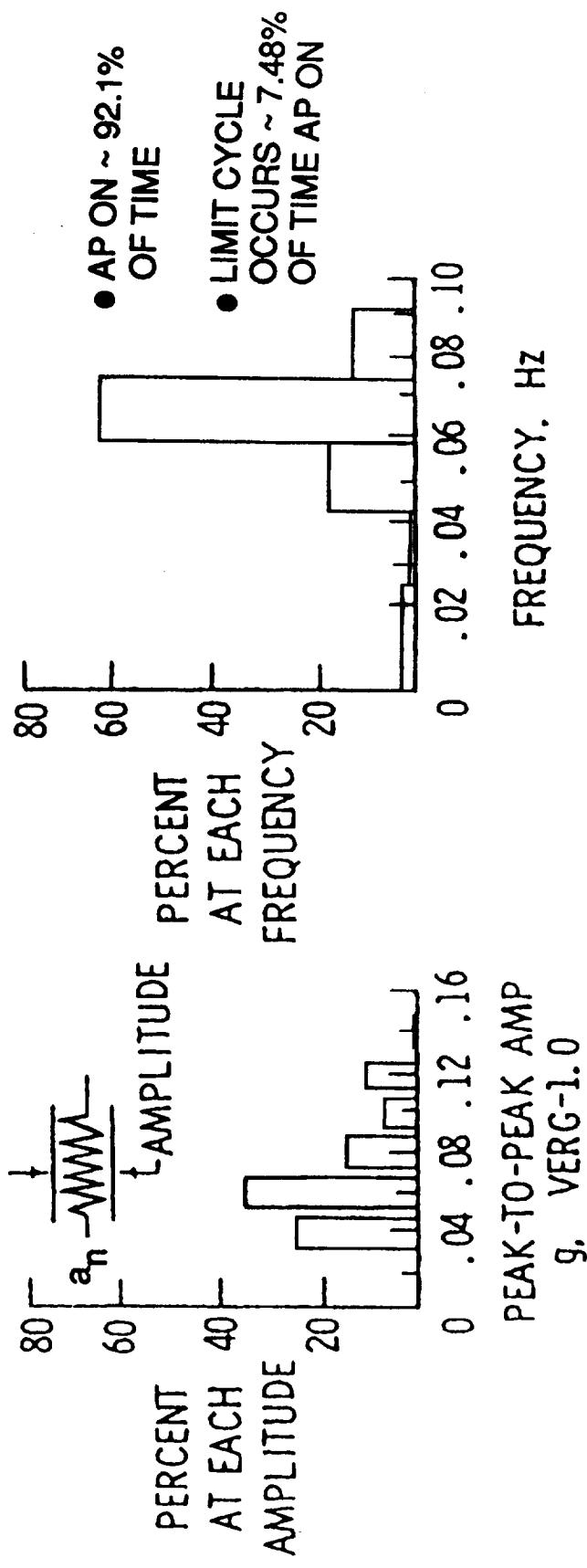


Figure 25.- Autopilot "limit cycle" experience.

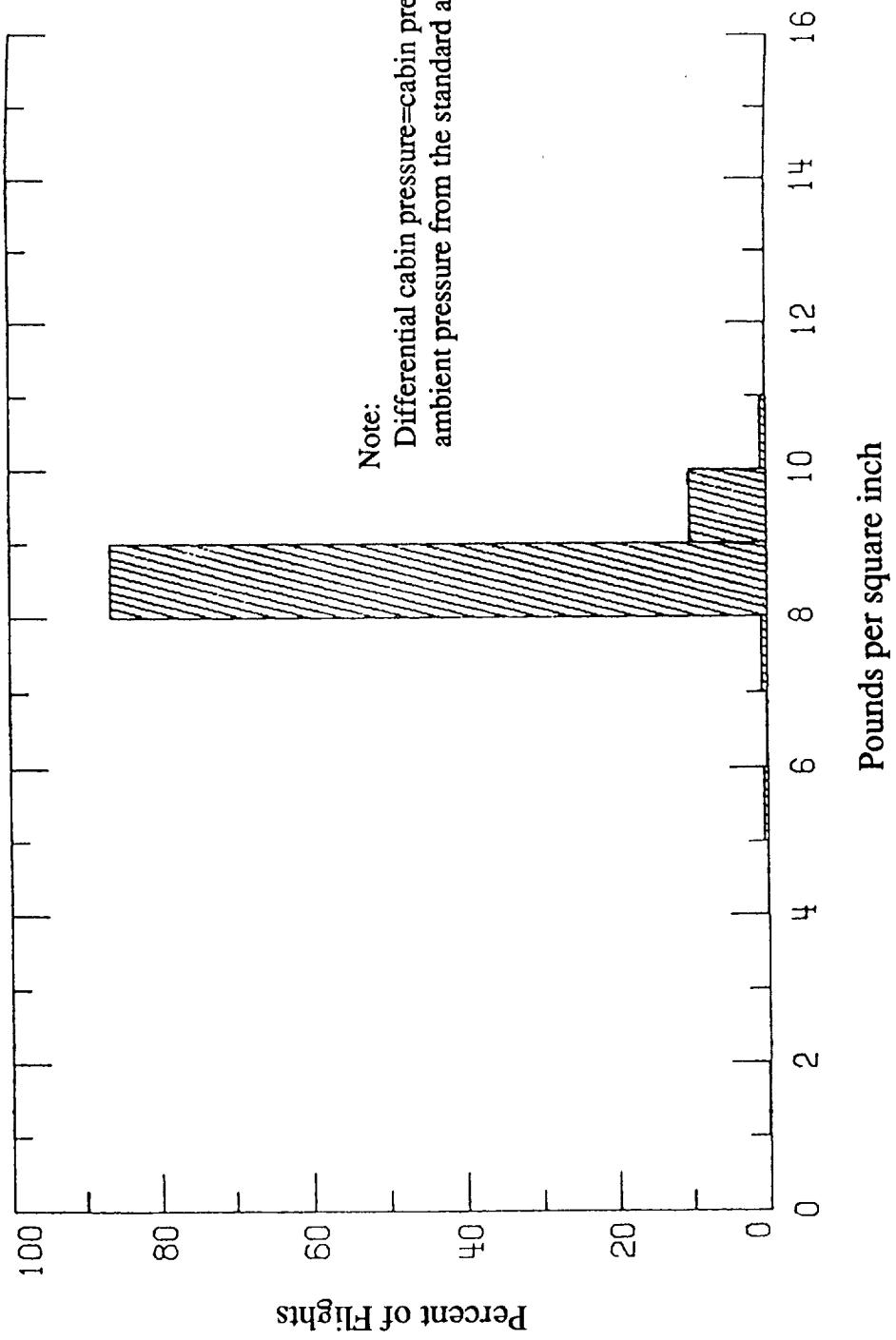


Figure 26.- Maximum differential cabin pressure per flight; Percent of flights.





## Report Documentation Page

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7. Author(s)  Norman L. Crabbill		6. Performing Organization Code	
9. Performing Organization Name and Address  Eagle Engineering, Inc. Hampton Division, Tower Box 77 2101 Executive Drive, Hampton, VA 23666		8. Performing Organization Report No.	
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